SCIENTIFIC AMERICAN

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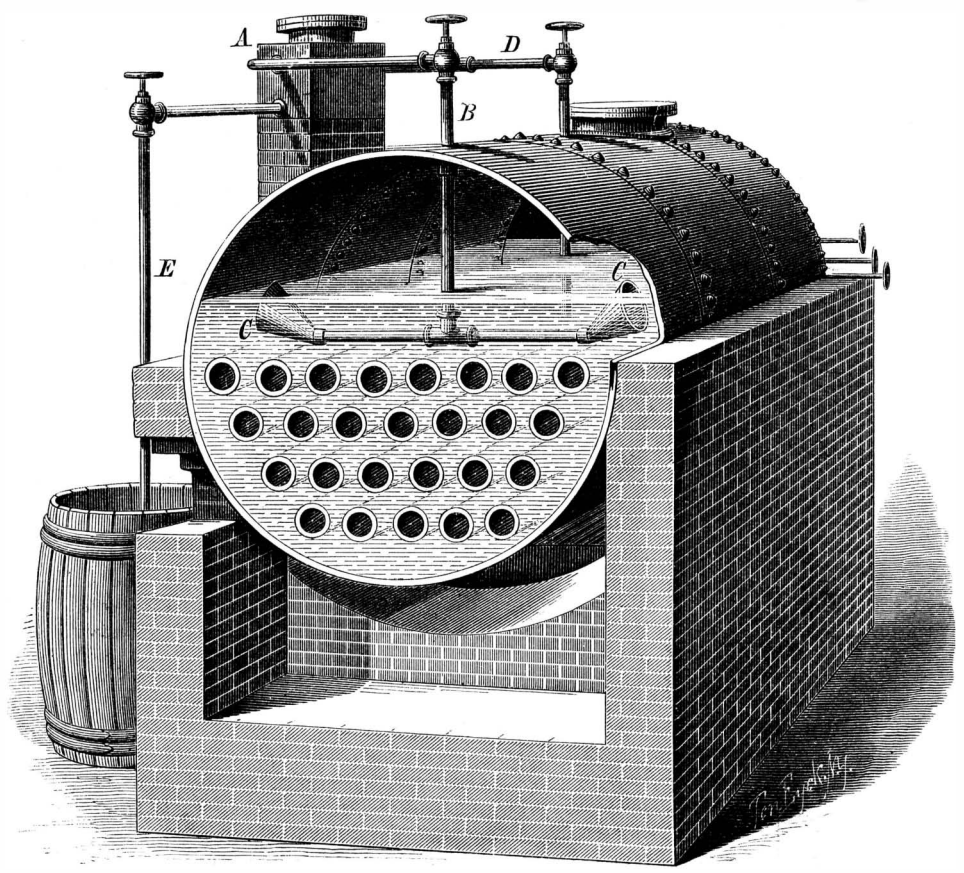
IMPROVED BOILER CLEANER AND MUD EXTRACTOR.

In the accompanying engraving we illustrate a novel device for the immediate removal of mud and sediment of all kinds, as fast as the same is separated from the water in steam boilers. The impurities are thus given no opportunity to deposit or adhere, and all formations of scale or accumulations of mud, so destructive to boilers and prejudicial to their economical use of fuel, are consequently, as it is claimed, prevented, as is the evil of foaming.



KEMP'S BOILER CLEANER AND MUD EXTRACTOR.

The illustration represents the device applied to a return tubular boiler. A is a box or reservoir, located above or upon the arch wall of the boiler. In marine boilers the reservoir may be suspended from the deck frame above. From this reservoir three pipes extend; the first pipe, B, enters the rear part of the top shell of the boiler or generator, and is connected with a horizontal pipe, which is adjusted a little below the water line. At either end of this horizontal pipe is an enlarged mouth, C, partly submerged, but extending a little above the surface of the water, the mouths being of a diameter to allow several inches variation in the water line. The second pipe, D, leading from the reservoir, A, enters the other end of the boiler in similar manner, terminating below the water surface. When the boiler is heated, a constant current of water is immediately established through the bell mouths, C, and pipe, B, filling the reservoir, A; and, cooling to a certain extent, it returns to the boiler by the pipe, D. It will be observed that the up flow pipe is placed about midway between the fire bridge and the back end of the boiler, at a point where the water is presumably hottest. On the other hand the down flow pipe enters the front or cooler portion of the water; and while the water may rise and fall in the boiler to any moderate extent, the enlarged mouths, C, will constantly maintain a current (free from steam) from the surface. As the sediment and impurities are chiefly separated from the water by ebullition, in that part of the boiler where the horizontal pipe, C, is located, they are immediately drawn in by the current and carried into the reservoir, A; here the current, weakened by expansion, can support the impurities no longer, and they settle in the reservoir, and are retained until blown off through the third pipe, E, as seen in the engraving. The reservoir may be located at any desired point above the level of the water line, as most convenient, and occupies no appreciable room. It usually holds about three gallons of water.

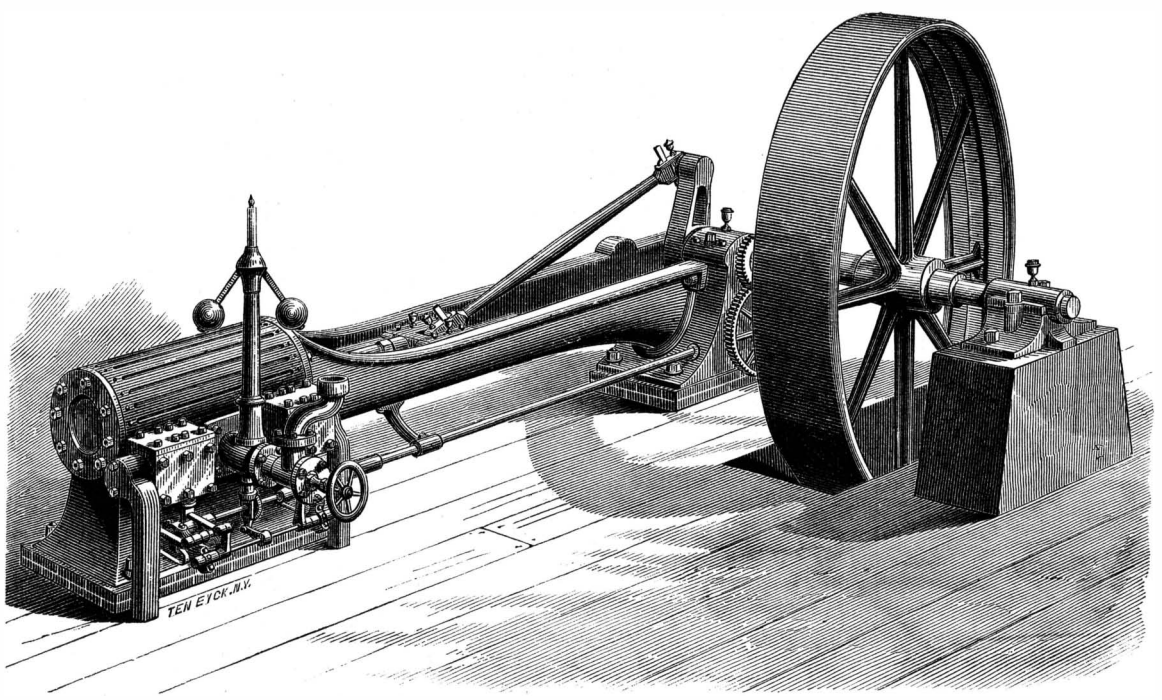
The invention has now undergone tests for over two years, and is claimed to have proved its efficiency, numerous testimonials from the many practical engineers in Canada and mill men on the Saginaw river, as well as owners of steamboats plying on that turbid and saline stream, bearing witness to that fact.

For fire box boilers it is well adapted, preventing, we are informed, all accumulations of sediment in the water legs; while after four week's run, no sediment has been found in the boiler, the old scale meantime becoming loosened and dropping off. The invention is applicable to all kinds of boilers, single or in batteries.

Patented August 17, 1875. For further particulars address James F. Hotchkiss (owner of the patent), Bay City, Mich. Patent for Canada for sale.

THE PUTNAM MACHINE COMPANY'S STEAM ENGINE.

The engine represented in the accompanying engraving was exhibited at the Centennial by the Putnam Machine Company, of Fitchburg, Mass. It is so constructed that the steam is admitted to the cylinder at full boiler pressure and at any point of the stroke, the point of cut-off being regulated by the governor, which is claimed to enable the engine to maintain a uniform rate of speed, notwithstanding variations in load or steam pressure. The valves are of the poppet order, and are self-balancing. Cut gears upon the fly wheel shaft operate a horizontal shaft beside the engine frame, and upon this shaft are cams which raise the valves at the beginning of the piston stroke. The length of time during which the cams hold the valves open for the admission of steam is regulated from the governor direct; and the valve-closing mechanism is so arranged that, no matter at what point of the piston stroke the cut-off takes place, it is done very rapidly and without shock. In the steam chests the upper and lower seats of the steam and exhaust valves are placed so near together as to leave only the requisite area of steam passage between them: thus reducing any liability to derangement from a difference in the expansion of the parts. By the removal of one cover, each valve may be withdrawn without separating the valves from the valve stem. The working parts of the valve mechanism are of hardened steel. The frame of the engine is truncated, and provision is made so that the pillow block can be changed to either side of the bed. The engine at the Centennial was of excellent workmanship throughout. For further particulars address the manufacturers as above.



THE PUTNAM MACHINE COMPANY'S STEAM ENGINE.

A Snake Show at Calcutta.

"It was early in the morning—not, however, before the snakes, which were in a series of wire-covered boxes, were awake and lively—that we were shown," says a correspondent, "into a stone-floored room some twenty feet long and twelve broad. In the boxes were the strongest and deadliest snakes in India: pythons, ophiophagi, cobras, korites, Russell snakes, and many others. The Hindoos who had charge of them were two slim, wiry, little men, nude to the waist, as most of their countrymen are. They wore neither gloves nor had any other protection, and had no instrument of any kind in the place. After showing the varied collection under their care, they proceeded to open the python cage, and one of them, putting his head in, seized a monster serpent and threw him upon the floor close to our feet. The python objected to such treatment, and began to hiss, making at the same time a vigorous effort to rise. But the snake-keeper was waiting for this, and no sooner did that huge, shining back begin to curve than the keeper put out his hand, and, seizing the creature's tail, pulled it back with a jerk. Instantly the python was powerless—hissing, but unable to move; the more he struggled, the more tenaciously did the keeper hold his tail, explaining meanwhile that so long as the reptile was controlled in that fashion there was no danger of its doing mischief; then, just as its rage was becoming ungovernable, the man lifted it quickly, and with a jerk deposited it in the box. Its companion was taken out in a similar manner, and slapped and buffeted till, throughout its entire length, some twelve feet, it quivered with passion, but all to no purpose; it, too, was replaced in the cage, and shut up to hiss at its leisure. The fact that an ophiophagus is in the Regent's Park Zoölogical Gardens, London, rendered the next exhibition more interesting, although it may be doubted whether the sudden throwing into so small a room of a snake seven feet long was agreeable to the visitors. However, there was really no danger, for the venomous creature was so completely in its keeper's power that we had no occasion to fear. One bite from the reptile, and any one of us would have been dead in five minutes, for it was exceptionally strong and lively; but it was no more able to bite us than the little mongoose caged outside the door. Up rose its head, out came its slithering tongue, its eyes dilated, its huge throat swelled, and all seemed ready for a desperate attack, when the keeper struck the reptile's mouth with the back of his hand, and, before it could strike him, had seized it just under the head. Then it struggled, but only to get away—it had met that native before, and did not at all approve of his treatment. Its tongue might move in and out as often as it pleased, but all to no purpose; and when the cage was opened, it slunk in."

THE medical journals, last spring, published repeatedly the formula for Dr. Ferrier's new remedy for cold in the head. As the season for that distressing malady is at hand, we print the recipe, which is: Trisnitrate of bismuth 6 drachms, pulverized gum arabic 2 drachms, and hydrochlorate of morphia 2 grains. This is used as a snuff, creates no pain, and causes, says the London *Lancet*, the entire disappearance of the symptoms in a few hours.

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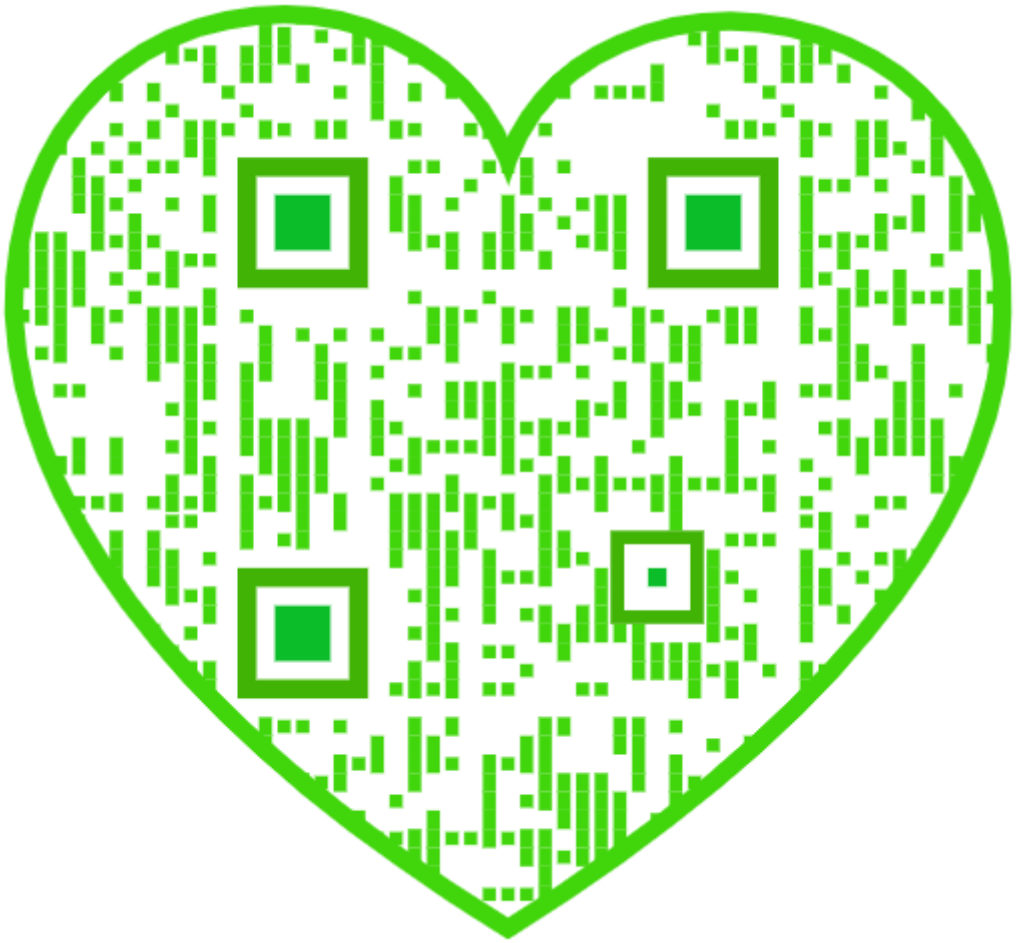

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III. TECHNOLOGY.—Manufacture of Artificial Butter, by Henry A. Mott, Jr., E. M., Ph. D. with six illustrations and full Description of the Process. This valuable paper conveys a large amount of practical information upon artificial butter making, explains the entire process, presents estimates of the cost of apparatus, mode of making, profits, etc., with plan of an artificial butter factory.—Safety-Lamp Cleaner.—Roman Magnificence.—The Pneumatic Pen, 2 figures.—Vanillin from Pine Trees.—Fireworks. Preparation of Colored Fires. Green, Red, Violet. Tables of Ingredients.—Gold in Pyrites.—Cement for Glycerin Mounts.—Photo-Transparencies and Enlargements.—How to Use Photo-Backgrounds, with 14 illustrations, by L. W. SEAVEY.—A most valuable practical paper, showing how photographic portraits may be improved to the best advantage, by the aid of backgrounds.

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The SCIENTIFIC AMERICAN SUPPLEMENT, we would here take occasion to state, was started, as its prospectus intimated, partly as an experiment, and without definite intention on the part of the publishers regarding its continuance after the present Centennial year. The success which it has encountered has, however, been so genuine, and the circulation which it has achieved so greatly beyond our anticipations, that it has been decided to continue its publication. As to the preparation and plans which we have in hand for rendering both SCIENTIFIC AMERICAN and SUPPLEMENT indispensable to workers in every branch of art, of industry, and of Science, the reader will find them fully detailed in our announcements on the advertising pages of this issue.

Those who have taken the papers through newsdealers are recommended to continue to do so, and those in the habit of procuring their papers weekly from the stands will find them there as of old; and those who neither subscribe for nor buy the SCIENTIFIC AMERICAN nor its SUPPLEMENT may peruse them both on file in any working men's reading room in the country, or in the library of any institution of learning in the world.

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PROSPECTS OF AERONAUTICS.

Though failure more or less signal and complete has been the fate of every attempt thus far made to navigate the air by mechanical devices, the problem has by no means been given up as hopeless. Better still, sufficient progress has been made of late toward a right understanding of the conditions and requirements of flight to justify the belief that the obstacles to be overcome are purely mechanical, and sure, sooner or later, to be successfully surmounted. The long sustained flight of birds sufficiently demonstrates the possibility of propelling heavy objects at great speed through the air by a purely mechanical apparatus: while the small amount of food which birds require for the generation of the energy expended in flight proves that only a moderate amount of force, rightly applied, is required for that sort of work.

The problems to be solved before aerial navigation takes its place among human achievements are consequently these two the invention of an apparatus to accomplish the work of the bird's wings and tail, and an engine capable of developing great power with comparatively little weight of machinery and fuel. For the purpose of navigation, the flying ship must be, however, like the bird, heavy in comparison with air, that it may not be at the mercy of every gust of wind; and it must be strong enough to withstand the pressure of strong gales or, what is equivalent, the resistance due to rapid motion. Hence it is evident that, whatever it may be the successful air ship will not be and will not contain a gas bag. For the practical navigation of the air, the balloon is and will ever be a delusion and a snare; and the general recognition of this truth by intelligent workers in this field is one of the most encouraging features of modern aeronautics.

It is quite possible that aerial rafts, supported by balloons, may sometimes be useful in regions favored with winds which blow steadily in a fixed direction for months at a time; but in ordinary climates, they cannot but be as useless for commercial purposes as log rafts in a sea everywhere as vexed by conflicting currents as Hell Gate was in its worst days. A self-propelling vessel supported by a balloon would be little, if any, better. No balloon light enough to sustain such a vessel could begin to withstand the pressure it would meet in stemming or crossing the current of a moderate wind, or in being driven through still air at the rate of twenty or thirty miles an hour: and unless it can do this and much more, it is out of the question for practical navigation.

After many experiments and no small amount of costly investigation, the Aeronautical Society of Great Britain, so long presided over by the Duke of Argyll, has pronounced decisively against the balloon as incapable of being made useful for the purpose of locomotion, except in the way of waftage; and in a recent report, the secretary of the society declares that the sole improvement of which the balloon is capable is the invention of some means to secure its ascent and descent without the expenditure of gas or ballast.

Suppose we have, for example, a balloon so weighted that it would float on the discharge of 35 lbs. of ballast, or on receiving an additional thousand cubic feet of gas. It is plain that, if some mechanical means (say a screw acting vertically) were added, capable of exerting a lifting force of 35 lbs. more than its own weight—a light two horse power would drive it—the voyager would be able to rise without discharging ballast, or sink without discharging gas; and so be able to avoid obstacles while drifting over the surface, or to rise above adverse currents to such as might be more favorable.

But for the purposes of real aerial navigation, such drifting is wholly inadequate. The work to be accomplished is not the floating of a relatively light body in more or less favorable air currents, but the propulsion of a heavy body with a force sufficient to overcome all aerial resistance, and with velocity enough to make the inevitable driftage relatively unimportant.

This has not yet been achieved, though the efforts toward it have shown some very encouraging results. Certain experiments made at the expense of the Aeronautical Society, to determine the exact lifting pressure of air currents against a plane inclined at different angles, obtained results which are especially promising. The plane used was a steel plate a foot square, and the substitute for wind or the resistance, occasioned by the passage of a body at high speed through the air, was the blast of a powerful fan blower. Placed at right angles to this blast, the pressure on the plate was 3¼ lbs., indicating a wind velocity of about twenty-five miles an hour. Inclined at an angle of 15°, the plate received a direct pressure of only one third of a pound, while the lifting pressure amounted to 1½ lbs. In other words, a plane of 1 square foot, held at an angle of 15° against a current of air having the velocity of twenty-five miles an hour, will carry four times as much weight as it meets resistance. A less angle than 15° could not be tried, owing to some obstruction to the action of the apparatus. The experiments showed, however, that the ratio of the lift to the thrust greatly increased as the inclination of the plane diminished, and also that the lifting power of the current, per square foot of plane, increased with the extension of the sustaining surface, probably on the same principle that makes a large sail on a ship so much more efficient than an equal area of small sails.

The chief thing that remains to be done for the successful solution of the problem of flight is therefore this: To drive a sufficiently broad-bottomed car, say from forty to sixty miles an hour, by means of apparatus acting on the air. With this velocity the resistance of the air would support the car, at the cost of a relatively small part of the driving force. A number of experiments have been made in this direction, perhaps the nearest to success being one in which a small engine drove a plane, carrying, with its weight, a load of 214 lbs. around a circular course (planked) at the rate of twelve miles an hour, by means of two wheels working in air and having a driving surface of 60 square feet. A speed three times as great would have been required to lift the apparatus from the ground.

Other experiments have shown that, by direct acting vertical screws, a constant force of three horse power will support 100 lbs.; and inasmuch as a one horse power engine has been made weighing no more than 13 lbs., the possibility of an engine's lifting itself in that way is clear. In another experiment made to ascertain what lifting power could be got from planes moving in horizontal orbits, an engine weighing 186 lbs. was prove capable, under very unfavorable conditions, of lifting itself with 40 lbs. additional weight.

If the results obtained by the fan blast and inclined plane are to be depended on, an engine used for propulsion ought to succeed even better than those employed direct in lifting.

ENGLISH DEALINGS WITH FOOD ADULTERATIONS.

If there is any one subject on which the British public is extremely sensitive, it is the quality and purity of its food and drink. No country, we believe, has such stringent legislative enactments against adulterations; and the legal formalities for their enforcement are made so few and simple that the aggrieved consumers now waste no time in vain denunciations, but summon the offending grocer or butterman forthwith before the nearest magistrate to answer for the fraud.

An excellent instance, showing how persistently warfare against spurious materials is waged, is found in attacks now being made in England on artificial butter. It is a well known fact that, until recently, attempts to produce even a moderately palatable artificial butter have failed; and although the product has been made of fair savor while fresh, a day or two's keeping has turned it into mere tallow. In England, however, the fraud has not ended at this. Conscienceless individuals have sold as butter, it is said, horrible concoctions of old lubricating tallow, and even old tallow candles *minus* the wicks, which an official analyst describes as "supplied to the poor in the last stages of rottenness." One factory was detected making this delectable product at the rate of two tuns a day. This and many other like cases being well known, it is but natural that the British public should cordially detest "grease butter." The London *Grocer* has lately printed long reports of trials of sellers of the adulterated material; and to show how rigidly the penalties against the adulterations are enforced, we note that a retailer who purchased grease butter, innocently supposing it to be genuine cream butter, and who sold it to a customer as

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the latter, was nevertheless fined $50, and further proceedings were ordered to be taken against the wholesale merchant from whom he obtained his supply.

We have frequently remarked this same severe dealing in England with every other species of food fraud. At the same time, no one need remain in ignorance as to what constitutes fraud, because the parliamentary reports on the subject, even in respect to tobacco and other unnecessary luxuries not classified as food, contain reliable and full information relating thereto. The whole matter is a suggestive one for us in this country. Here a prosecution of a retailer by a private citizen, because of the former selling ¼ lb. of grease for 1 lb. genuine butter, as in the above cited instance, would be considered extraordinary. Our main reliance for protection is in the vigilance of health boards, whose jurisdiction is local and limited in authority. Hence, in most cities, we may look in vain for either frequent prosecutions or reports of adulterations prepared under official auspices, although the possibility of such reports being compiled is plainly indicated by the admirable yearly work of the Massachusetts State Board of Health. Reports, however, can merely warn us of evils in the shape of food adulterations, under which we shall probably continue to suffer until penalties are enforced, as rigidly here as they are in England, against each and every retailer who wittingly or unwittingly sells a spurious article.

WHAT NEW YORK MIGHT DO WITH THE GREAT FRENCH STATUE.

Some time ago a number of enthusiastic Frenchmen, admirers of the United States, conceived the idea of presenting some monument to the people of this country, in commemoration of the ancient friendship of the two republics. Meetings were held in Paris, a subscription list was opened, and finally it was decided that the monument should be an immense statue, over 200 feet high, to be erected on Bedloe's Island, New York Harbor. The design is "Liberty Illumining the World;" and in harmony therewith, the hand of the figure holds a torch with a gilded flame, while at night a halo of electric light surrounds the head, so that the statue becomes a lighthouse. M. Bartholdi, a celebrated French sculptor, was commissioned to execute the work, and his operations have progressed as far as the completion of one hand and fore arm, at present erected in the Centennial grounds. Now, however, there is a hitch in the money matter; and unless the citizens of New York manifest a greater interest in the enterprise than they have hitherto done, it is feared that the project will meet the fate of the proposed colossal Washington monument, the corner stone of which was laid by Governor Young, in this city with impressive ceremonies some thirty years ago, but of which even the site is almost forgotten. It appears that it has been left to the people of New York to erect the pedestal and also to pay part of the expense of making the statue; but probably for the reasons that our harbor is already brilliantly lighted, and that a statue for ornamental purposes is not particularly needed among the shipping, and that the sum to be subscribed is quite large, our citizens have thus far failed to respond to the call upon their purses. Meanwhile, in Philadelphia it has been proposed that, if New York thus virtually declines the gift, Philadelphia shall secure it for her inland harbor.

We are not among those who favor letting the project die or be transferred to our sister city for want of pecuniary help here, first, in consideration of the donors' munificence, and second, because New York is rather deficient in works of art, and therefore the more we can get of them the better. We think, however, that a much superior site to the low-lying island might be selected, and that, if a proper situation were chosen, our citizens would view the matter much more favorably. Our idea is that the Battery is the place for the statue, and we would erect it there in lieu of on the place assigned to it.

AMMONIUMNITRODIPHENYLAMIN.

This remarkable compound, the chemical name of which is rather long, but scientifically correct, is manufactured in Switzerland; and it was, in the year 1874, introduced into trade, for dyeing silk and wool with a most magnificent orange color. But it produced the most alarming poisonous symptoms among the workmen who handled it; the use was therefore soon discontinued, and the manufacture abandoned. Dr. C. A. Martins, director of the Berlin anilin manufactory, found that the poisonous properties were not constantly inherent in the pure article, and that they were due either to impurities or to certain methods of manufacture; and he succeeded in making a harmless ammoniumhexanitrodiphenylamid, which is now sold under the more convenient name of aurantia. The longer name is, however, the proper one, as it gives the chemical composition and derivation, which, for the benefit of non-chemical readers, we will now explain.

Amin is a derivation of ammonium, the formula of the latter being $N H_3$, while that of amin is $N H_2$. This base, combined with phenylic acid, or rather with phenyl alcohol, $C_6 H_5 (O H)$, forms phenylamin, $C_6 H_5 (N H_2)$, which is sold under the name of anilin, $C_6 H_7 N$. Diphenylamin contains two molecules of phenyl, and is represented by the formula $2 (C_6 H_5) (N H_3)$. Nitro-diphenylamin is a combination of the latter substance (as a base) with nitric acid, the formula being $N O_2$, $2 (C_6 H_5) (N H_2)$. *Hexa* means six; and six molecules of nitric acid can be combined with the base, as the latter is a hexad, with the formula: $6 (N O_2) 2 (C_6 H_5) (N H_3)$. This is the hexanitrodiphenylamin; and finally, this substance being an acid salt, it is neutralized with ammonium, making an ammoniumnitrodiphenylamin, of which the formula is $N H_3$, $6 (NO_2) 2 (C_6 H_5) (N H_2)$, which is equivalent by contraction to $C_{12} H_{15} O_{12} N_8$, the formula for aurantia.

The latter formula only shows the ultimate sum total of atoms, and not the nature of the compound, which is shown in the former formulæ: but it is well known that the same number of atoms can be combined in various ways, producing compounds of the same ultimate composition, although they differ in all their chemical and physical properties, so that the simplest formulæ cannot always be trusted as the true one.

We give these details to show to the uninitiated that the apparently unnecessary long chemical names, often used in these days, are not a mere fancy of the chemists, but are based on elementary principles, combined according to a well considered practical system

SILENCE AND HASTE AT DINNER.

There is probably not one among the readers of this paper who would not assent to the general proposition that habitual haste in eating is hurtful to digestion. Everybody knows that food hurriedly eaten is very likely to be insufficiently masticated, and not properly mixed with those salivary secretions which are essential to the perfect digestion of many kinds of food, particularly breadstuffs and other starchy preparations. Everybody knows, further, that food hastily swallowed is very apt to carry with it more air than is good for the stomach. Each bolus fills the bore of the œsophagus, and pushes before it all the air that tube contains; the successive charges fill the stomach to distention, often paralyzing its action for a time, and always favoring fermentation of the food rather than its proper solution. All this, and much more of equal physiological importance, is well known to every intelligent reader, and we may safely assume that all our readers belong to that class.

It is therefore no easy task which a fair correspondent has set us in a well written communication just received. The gentlemen of her family, she tells us, have long been subscribers to the SCIENTIFIC AMERICAN, and they hold its utterances in high esteem. Consequently she appeals to us to read them a lesson on the evils of hasty eating, hoping that our advice will be heeded, to the benefit of their health and the material enhancement of her enjoyment of the dinner hour.

She writes: "It has become the custom of our gentlemen to devour a newspaper with their breakfast, which, being light, we must permit; but when the meal of the day, dinner, is eaten, it is surely as unwholesome as it is disagreeable to all present to have the head of the house sit with absorbed look, eating as if for a wager, and impatiently watching the servant hand around and clear away the dishes. I am one of five suffering wives, who never eat our dinner without feeling that we are taking time from some business which our husbands long to return to. We have therefore resolved to appeal to you to address from your editorial chair these men who are seeking dyspepsia and making our tempers sour by the trying ordeal of dinner."

If any word of ours could arrest so suicidal a course on the part of any of our readers, our petitioners may be sure that it would be spoken with all emphasis. But here's the rub: the evil complained of is in many cases one of habit, and not amenable to correction through reason; in more cases, probably, it is one of necessity, under conditions for which the offender is not morally responsible; very rarely, we fear, is it the result of deficient or defective information. And since we know nothing of the circumstances of the present case, any suggestion we may make must necessarily be of the most general character, as likely to miss as to hit.

For example, we might enlarge upon the horrors of dyspepsia, its disastrous influence upon character, its power to acidify and eclipse all the sweetness and light of living, even where it does not put an end to life outright: only to receive the crushing reply from five, or five thousand, suffering husbands: "We know all that, probably as well as you do. But how can we help ourselves? If we were independent of the duties and responsibilities of active life, we might, and certainly would, very gladly eat our dinners with leisurely enjoyment; but the demand upon our time and thoughts are such that we cannot do as we would; we are parts of a great machine, and are driven to sacrifice our pleasure, our health, may be: and possibly, what we regret still more, the good temper of our wives, because of the rights and requirements of those with whom we have to do business."

This is very largely the case where dinner is eaten before the day's work is done. And when it comes in the evening, physical fatigue and nervous exhaustion from the conflicts of the day are not unseldom equally fatal to the social enjoyment of dinner. It is easy to say that men should lay aside their business schemes and anxieties at such a time, and we admit that it is both the moral and the physiological duty of men to try to do so: still men, as a rule, have not yet reached a stage of moral development at which duty perceived is equivalent to duty done. When the penalty for wrong-doing is apt to be indefinitely deferred, as in the case of silent and hasty eating, and when the reward for right-doing is not always immediately apparent, right-doing is likely to depend upon incidental conditions; and here the truth compels us to observe that the ladies are often quite as much to blame as the gentlemen for the unsocial and unsanitary habits of eating which the latter so frequently acquire.

For our own part, we approve of the morning paper at breakfast. Generally it is the only means of securing deliberate eating at that hour. It is easy enough for those who have little to do to enjoy a social breakfast at ten or eleven o'clock in the morning; but earlier—and especially if the battle of business is to follow at once—humanity is not social, and conversation, except with regard to the morning's news, is all but impossible. The morning paper therefore is in most cases not only a sanitary brake upon the jaws at breakfast, but a real blessing to the family as well as to the reader's stomach.

At the midday meal, business is pressing and time brief. As a rule, whatever a business man eats at such a time must be taken hurriedly. The effect is bad, it is true: but it is a choice of evils, either to eat quickly or go without. For this reason it is, whenever possible, the custom to take the main meal of the day after the business hours are over. It is with reference to this meal, we take it, that the just protest against haste and silence has been uttered.

The pestilent heresy, moral as well as sanitary, that it is unbecoming an immortal being to enjoy his dinner is well nigh extinct; we trust the once prevalent insanity of self-immolation upon the altar of business push and worry is also dying out. Active men are learning that the human machine can be run to death; that moderation pays best in the long run; and that no time is more wickedly wasted than that which is unduly saved (?) from the hours of rest and *re*-creation—including in the latter the dinner hour. In the scientific code of conduct, deliberate and enjoyable eating is one of the fundamental virtues. It ranks with justice in the moral code. It is a virtue, too, which can be, and ought to be, cultivated by all, most of all by those who are doing the world's best work.

But, generally speaking, it is a virtue, the cultivation of which calls for effort on the part of the ladies as well as self-restraint on the part of the gentlemen. No sensible man will willingly hurry through a meal when he is keenly enjoying the food and its accompaniments; and it depends chiefly upon the ladies to secure such conditions at the family table. How they can do so, it is not for us to say. There can be no general rule for their attainment any more than a single specific for all diseases. The special conditions and requirements of each household and the idiosyncracies of its members must chiefly determine the course to be pursued.

There is one point, however, a very important point, which ladies very often overlook. It is this: Civilization and hunger are incompatible. All the virtues and graces of of humanity—certainly of male humanity—fly before an empty stomach. It may be possible for a man to be hungry and amiable at the same time, but it is not safe for any wife to presume upon so unlikely an occurrence habitually. Ignorance of their physiological truth has been the ruin of many an otherwise happy household. And we may set it down from both observations and experiences—premising that our experience in this respect has been exceptionally happy—that prepandial discretion is the severest test of a good wife. Just before dinner is the worst possible time to bother a husband with questions or complaints, or even with efforts to be aggressively agreeable. There is the time above all others when social silence should grace the home, and make it seem to the tired man the most delightful and restful place on earth. Half an hour of quiet just then is the best possible preparation for the social enjoyment of the coming meal, for then the nervous tension and mental strain of business care and anxiety can be gradually relaxed, and the entire system brought into conditions for enjoying food and the amenities of social life. Yet how frequently does the wife choose that particular time to speak of her own trials and troubles, the misconduct of servants or children, the petty requirements of the household, or other things trivial or disagreeable, and then marvel that her husband's temper is not so sweet as it ought to be! The offense is worse even than introduction of such topics at meal time.

Another physiological fact is often overlooked by well meaning wives who have to complain of the husband's haste or taciturnity at table: that is, the softening influence of a little savory and easily assimilated food to begin with, something calculated to alloy the irritant cravings of hunger while stimulating the appetite: this especially when the gentlemen are mentally or physically exhausted by the labors of the day. At such times soup is even more conducive to sociability than wine.

This is perhaps not at all what our correspondent asked for, still it seems to us the most practicable way to cure the evil complained of. The kindness, tact, and skill of the ladies before and during dinner can, in our opinion, do infinitely more to correct their husbands' unphysiological habits in eating than any amount of scientific disquisition. Let the ladies recognize the physiological conditions of the offence and the offenders, and—while trying to prevent or correct them—study to make the dinner hour so agreeable that their husbands will not be in haste to have it over, and the desired reform will most probably come as a natural consequence, if any reform is possible.

HOT WATERPROOF CEMENT.—The following is a valuable cement which, if properly applied, will be insoluble even in boiling water: Gelatin, 5 parts; soluble acid chromate of lime, 1 part. Cover the broken edges with this, press lightly together, and expose to the sunlight: the effect of the latter being to render the compound insoluble.

A HARMLESS glaze for earthenware, destined to replace the lead glazes hitherto employed, has lately been devised by M. Constantin. One recipe is 100 parts silicate of soda, 15 powdered quartz, and 25 Meudon chalk. Another is the same with the addition of 10 parts of borax. The articles glazed can be colored by copper for green, and manganese for brown.

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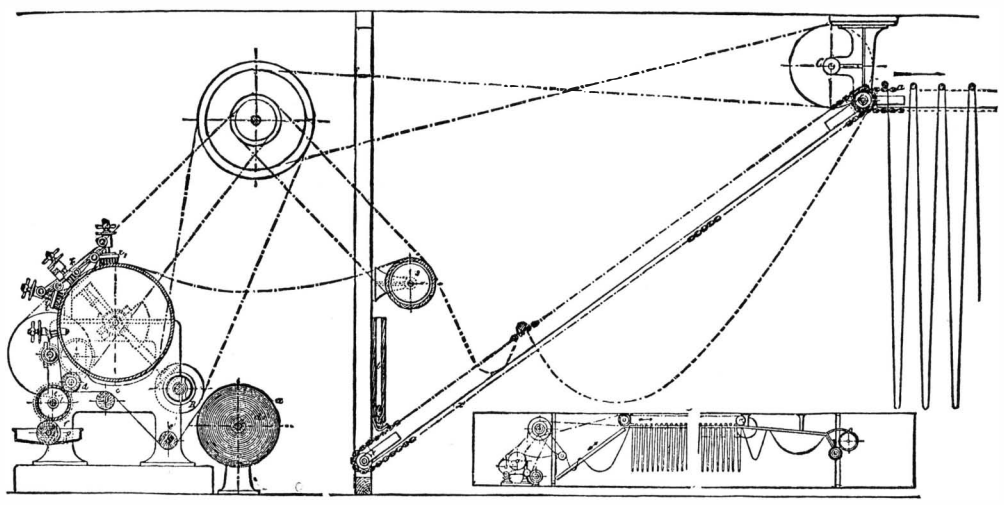
NEW MACHINE FOR PRINTING COLORED PAPER.

The annexed engraving represents a new apparatus for printing colored paper, devised by M. Flintsch, the engraving of which we extract from the *Revue Industrielle*. The paper is led from the roll, *a*, Fig. 1, above and below guide rollers, *b*, *c*, and *d*, and thence to a felted roller, *e*, where it receives the color from the printing roller, *f*. The paint is held in a reservoir, *g*, and the paper passes over the roller, *h*, while the color is uniformly distributed by the fixed brushes, *j*, and movable brushes, *i*. The paper is then led over a guide roller, *s*; and as soon as one of the sockets attached to the inclined chain engages one of the bars of wood placed in the box, *t*, the paper is looped over the bar, and is thus carried upward by the moving chain. On reaching the summit of the inclined plane, the bar passes to a horizontal chain which moves very slowly forward. The paper, lastly, reaches a pair of cylinders (shown on the right of Fig. 2, which is a general view of the whole apparatus), on one of which it is rolled.



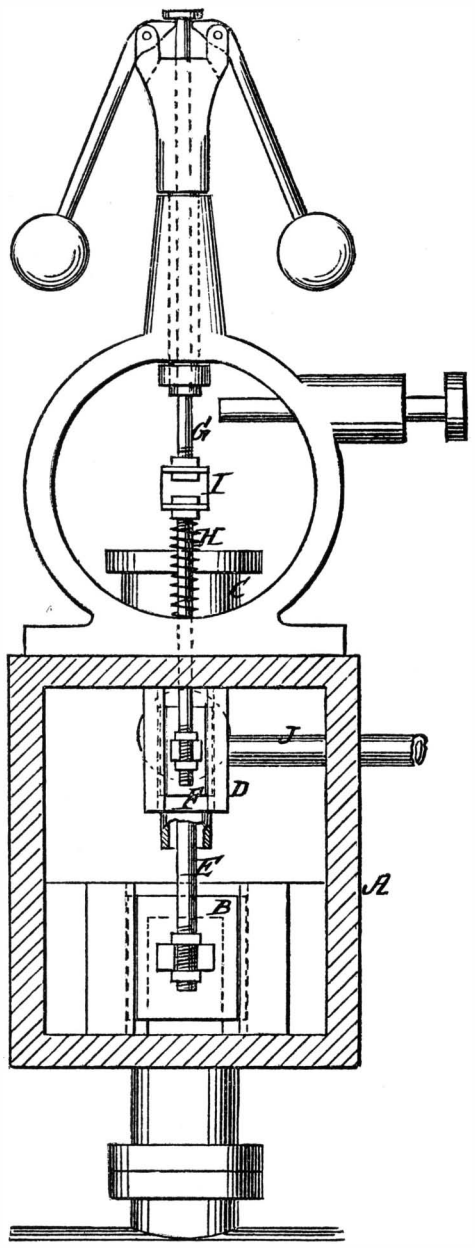
FLINTSCH'S PAPER-COLORING MACHINE.

Chloride of Lead Disinfectant.

The London *Lancet* directs attention to the value of chloride of lead as a deodorizer. The manner of its use is to dissolve half a drachm of the nitrate in a pint of boiling water, and pour this solution into a bucket of water in which two drachms of sodic chloride (common salt) have been dissolved. After chemical action has taken place, the clear supernatant liquid is an odorless saturated solution of chloride of lead. If this solution be thrown into a sink or vault from time to time, the disagreeable odors will soon be destroyed. A ship's bilge was completely disinfected in this way by simply dissolving half an ounce of nitrate of lead in boiling water, and pouring it into the bilge water, which itself supplied the necessary sodic chloride. Cloths wet with this solution, and hung in fever and accident wards of hospitals, are said to keep the atmosphere sweet and healthy.

A NEW STEAM GOVERNOR.

Mr. John K. True, of San Francisco, Cal., has patented through the Scientific American Patent Agency, September 19, 1876, an improved steam governor, an engraving of which is given herewith. A is the chest containing the throttle valve, B, admitting steam to the valve chest of the engine to be regulated. D is the small engine for working the valve, B, which is connected to the piston rod, E. F is the valve to the small engine, the rod of which is coupled to the governor, G; so that when the balls of the governor rise by increase of speed, valve, F, will descend, and admit steam in the upper end of engine, D, which will close the valve, B; and when the balls fall, it will admit steam to the lower end and raise the valve, B. The spring, H, on the rod of valve, F, balances the weight of the valve. The valve, F, can be set for high or low speed by the adjustable coupling, I. J is the exhaust pipe for engine, D. It is proposed to construct the valve, F, so that both steam ports will be a little open when both exhausts are closed, and thus the piston will be prevented from making full strokes, and when the opening of one steam port is slightly increased by the movement of the valve, the opposite exhaust will be slightly opened, to allow a little movement of the piston.



The Cheese Industry.

Our English cousins are still unhappy over the immense importation of cheese from the United States. Their agricultural journals are still scolding the farmers, for making an inferior article, and thus allowing our factory-made cheese to supply the English market. The London *Grocer*, in referring to a meeting just held by the cheese makers, states that an association was formed, called the British Dairy Farmers' Association, to which the editor alludes as follows:

"There is plenty of work for the new association to do. Our cheesemakers may be taught a good deal with advantage, and there are many reforms which they may usefully adopt. Hitherto they have been an isolated and unsocial community. As a consequence, they have made no progress; their trade has languished; the Americans have been gradually driving them out of the market. Some few years ago, dairy farmers saw that, if they were to live by cheesemaking, they must make some radical alteration; and this fact being especially evident in Derbyshire and Cheshire, the farmers there took a hint from their American competitors, and established cheese factories on the American principle. The Americans are running us hard, and send cheese over here which for price and quality is hard to beat. But it is mostly cheese of the lower sort, and cannot in any way be compared with some of the fine qualities of English production. What we want, however, is an improvement in the general quality of the cheese made in this country, and we hope that in this respect the enlightened teaching of the Dairy Farmers' Association will do great good. With proper care and skill in the processes of production, with a better knowledge of the nature of the materials they are employed upon, and with a little more enterprise, English cheesemakers may defy the competition of the world."

Honorable Employment.

There is noting derogatory in any employment which ministers to the well being of the race. The plowman that turns the clod may be a Cincinnatus or a Washington, or he may be a brother to the clod he turns. It is in every way creditable to handle the yard, and to measure tape; the only discredit consists in having a soul whose range of thought is as short as the stick and as narrow as the tape. There is no glory in the act of affixing a signature by which treasures of commerce are transferred, or treaties between nations are ratified; the glory consists in the rectitude of the purpose that approves the one and the grandeur of the philanthropy that sanctifies the other. The time is soon coming, the Chicago *Journal of Commerce* thinks, when, by the common consent of mankind, it will be esteemed more honorable to have been John Pounds, putting new and beautiful souls into the ragged children of the neighborhood, while he mended their fathers' shoes, than to have been set on a throne.

Treatment of Ash.

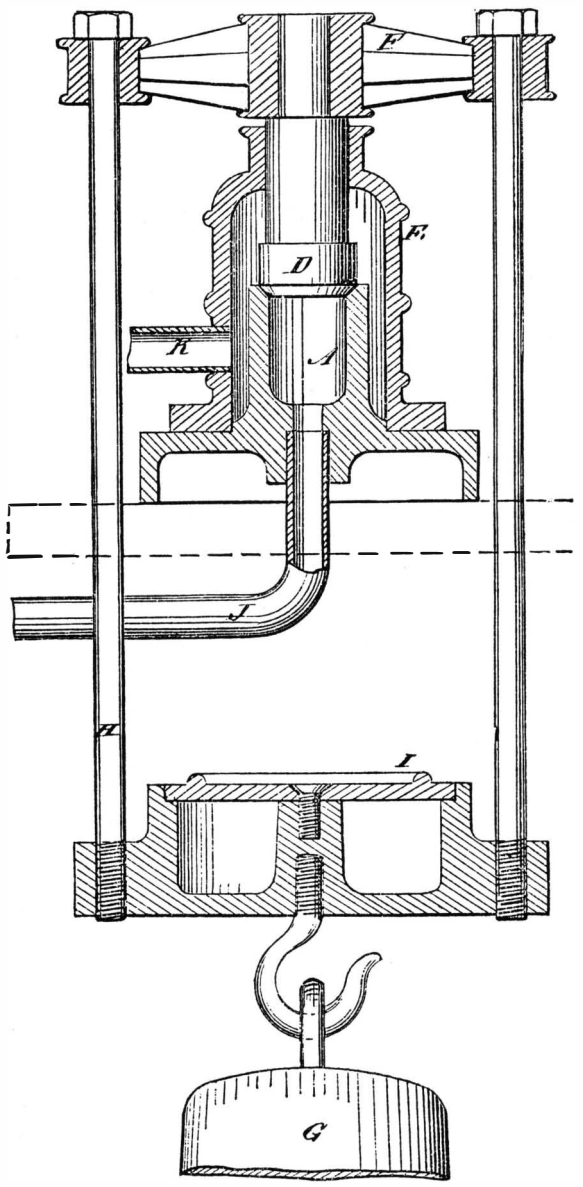
Woodworkers will find the following advice, from the *Northwestern Lumberman*, useful in the treatment of ash, to render it pliable.

Steam is the ordinary means used to soften ash; but when it is practicable, boiling in water is the best. The chief thing is to have the right kind of ash, as some kinds bend and others do not. One tract of land may furnish the best of ash; while another, lying close by and having just as good a soil, may produce only an inferior quality. The timber must be heavy and tough, and cut from good trunks. No matter if it has been cut and dried three years. A splinter of this quality of ash can scarcely be torn off, and runs the whole length of the wood before it ceases. Half an hour's boiling is sufficient to soften a piece of wood 23·4 inches thick. When the wood is taken out of the kettle, put it in the brace, screw and wedge it in the desired form without relaxing, and let it cool a few hours. After the wood is thoroughly dried in the brace, unscrew it and take out the wedges; it will always then retain its form.

IMPROVED STEAM GAGE.

Messrs. H. and A. Greenleaf, Brooklyn, N. Y., have patented through the Scientific American Patent Agency, August 29, 1876, a novel apparatus for testing steam pressure, by which the pressure of steam on an area of any given size—say a square inch—may be weighed by means of weights lifted directly by the steam without a lever or spring. In the annexed engraving, A is a hollow cylinder, setting upright on a base adapted to rest on a shelf. It is open at the top, on which a circular valve, D, one square inch in area, is seated. The rod of the valve works without friction through the top of a case, E, surrounding the cylinder, and has the cross beam, F, attached to its upper end. The weight, G, for weighing the steam pressure, is suspended from this beam by the rods, H. There is a holder, I, for weights to be added when required. The rods pass through the table for a guide and support against lateral movement. Steam enters the cylinder, A, under the valve by the pipe, J, and the exhaust passes off through the pipe, K. The apparatus is intended as a permanent fixture in a boiler room, and is a positive and comprehensive instrument, readily at hand to test the accuracy of the steam gage and working condition of safety valve, whether the engine is running or not, without the necessity of disconnecting steam fittings, or mathematical calculations. The action of the steam is a direct dead lift of the exact counterbalance of the pressure upon the valve; and the weights being hung directly under the valve, the valve will seat in its proper place without the necessity of the valve stem fitting tightly in the guides.

For want of such a device, engineers generally depend upon their steam gages, the accuracy of which is doubtful, as in many cases they are seldom or never tested, and thus run great risks that may be avoided by this instrument. In case of testing boilers by hydrostatics, this instrument may be used to any given pressure by simply adding weights up to the required amount.



A GOOD CEMENT FOR GLASS.—Orange shellac, bruised, 4 ozs.; rectified spirits, 3 ozs. Set this solution in a warm place, and shake frequently until the shellac is dissolved. This cement will stand every contingency but a heat equal to that of boiling water.

TO ATTACH TIN TO METALLIC SUBSTANCES.—Mucilage tragacanth, 10 ozs.; honey of roses, 10 ozs.; flour, 1 oz. Mix

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CURIOSITIES OF THE CENTENNIAL.

The Mineral Annexe to the Main Building was probably less visited by the general multitude than any other part of the great display. It was off the line of travel, obscured by its huge neighbor and (owing to its containing "nothing but old stones," as we heard a rural visitor contemptuously remark as he turned on his heel on the threshold) people, when limited on time, invariably omitted it from their sight-seeing programme. Mineralists and antiquarians selfishly viewed this state of affairs with vast satisfaction, because, even when the crowds elsewhere rendered aisles impassible, the passages of this annexe were free, and one might study the collection leisurely and undisturbed. A great many thoughtful people, who belonged to neither of the above professions, however, found the "old stones" one of the most interesting exhibits in the whole Exposition, and for the reason that those rudely fashioned fragments tell us all that we know concerning that mysterious race that owned our land, long before the Indians became possessed of it.

MOUND BUILDERS' RELICS.

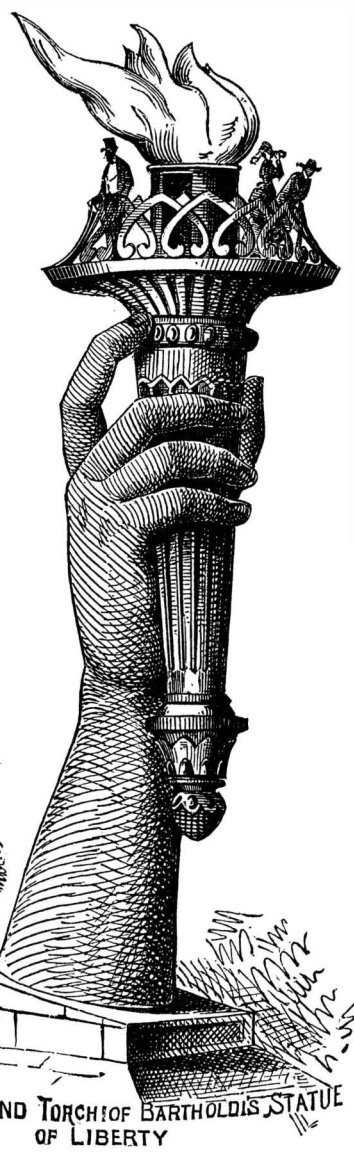
Here were arrow heads of flint, broad axes of stone, mortars and pestles the same as Mexican tribes use today, copper pots and kettles, rude needles of bone, spears, and personal ornaments. There were skulls dry and black with age, belonging to that race which came whence we know not, and which disappeared as mysteriously as it arose, leaving us nothing but the mounds which dot the Mississippi and Ohio valleys, and these crude relics, to tell of their existence. All that the strictest research has determined regarding this strange people may be told in a paragraph. Their works, in magnitude, dispersion, and uniformity, indicate a numerous population essentially homogeneous in customs, habits, religion, and government. They belonged to a family of men, says one learned antiquarian, "moving in the same general direction, acting under common impulses, and influenced by similar causes." No tribe of Indians ever known has attained the social state which would enable them to compel the unproductive labor of the people to be applied to the works that we now find. Geological formations and the condition of the human remains obtained prove that the monuments of the Mississippi valley are at least 2,000 years old. And this is all. Who built the mounds, whether their authors migrated to remote lands, or whether they were swept away by a conquering people or by a terrible epidemic or famine, are questions probably beyond the power of human investigation to answer.

It is curious that, while the cuneiform characters of the ancient people of the East and the hieroglyphics of the Egyptians can now be translated into modern tongues with ease and certainty, American inscriptions still defy the efforts of the antiquarians. Yet we have monuments of the Aztecs with engraving upon them which we are reasonably certain is written speech, and in this respect we have a foothold for further efforts, which, as regards the mound builders, we do not possess. We have inscribed stones, it is true. Some are merely covered with representations of animals and no writing, as are the Arizona Painted Rocks, illustrated in this issue. In our collection of Centennial curiosities, we give sketches of two examples, having inscriptions similar to writing, but there is no certainty that such is the fact. The Michigan tablet has scratches on it resembling Runic characters; some of the marks correspond to the A, K, S, D, I, and O of the old Norse tongue, as a comparison with the alphabet shows; others are destitude of any like resemblance. The Cincinnati tablet is an elaborately engraved stone, found with some human remains in a mound in Cincinnati, Ohio. The engraving may be merely ornamental, a view to which its symmetry would lead; but, on the other hand, it bears a not remote resemblance to known Central American hieroglyphics. Again, so many such tablets have been found and declared spurious, or as belonging to a later race, that, even admitting these that presented were, as they doubtless are, genuine mound relics, there is no proof that the race which built the mounds originally deposited them there. And thus even these slender aids to lifting the veil, which covers the past history of the land we live in, are of no real use.

BARTHOLDI'S STATUE OF LIBERTY.

The hand of the great statue which it is proposed to erect

THE CINCINNATI TABLET.



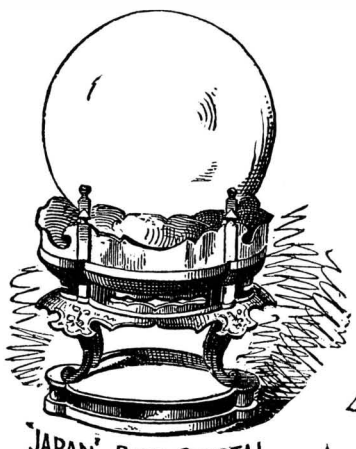
HAND AND TORCH OF BARTHOLDI'S STATUE OF LIBERTY

"RUSSIA"

SILVER NAPKIN & GOLD VESSEL

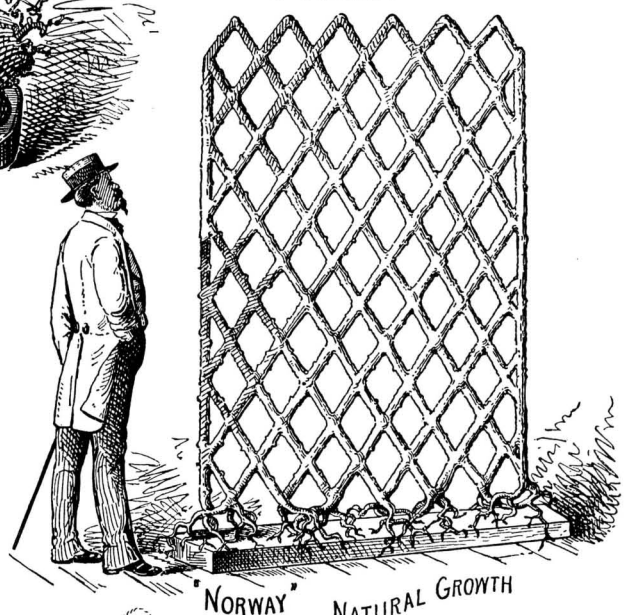
JAPANESE BRONZES SEA GOD.

"JAPAN" ROCK CRYSTAL



"JAPAN" ROCK CRYSTAL

"GOLD COAST" PLAYTHINGS



"NORWAY" NATURAL GROWTH

SOUTH AUSTRALIA. EMU EGG ORNAMENT.

"PORTUGAL" WATER MONKEYS.

SOUTH AUSTRALIA. EMU EGG ORNAMENT.

Curiosities at THE CENTENNIAL EXHIBITION.

MICHIGAN TABLET.

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on Bedloe's Island, New York harbor, is set up in the Centennial grounds, in order to afford to the people an idea of the colossal size of the figure when it shall be completed. The weight of the member, with the torch which it holds, is about ten tuns. It is not cast, but is made of thin copper plates hammered into shape and riveted together. The length of hand and wrist is about eleven feet, the second finger is six feet long, and the thumb nail is thirteen inches square. The circumference of the thickest part of the fore arm is sixteen feet six inches. The gallery around the torch accommodates about twelve persons. The total hight of the statue will be one hundred and fifteen feet, or, including that of the pedestal, two hundred and twenty feet, about thirty feet less than the hight of Trinity church steeple in this city.

JAPANESE ART OBJECTS.

In a large number of the famous Japanese bronzes, exhibited in the Main Building, the subjects were notably derived from Chinese or Japanese mythology. One of the most magnificent of these works of art is represented, though of course without its exquisite detail, in our sketch, and is an incense-burning vessel held in the hands of a sea god or devil, above whose head the legendary dragon rears itself. For bronzes of this description, the metal is cast in clay molds formed upon models made of a mixture of wax and resin, which is melted out from the finished mold previous to pouring the metal in. The melting furnaces are of exceedingly small dimensions, and generally are iron kettles lined with clay. After casting, the pattern is carefully corrected and worked out by chiseling; but the best bronze casters prepare the model, the mold, and the alloy in such a way as to produce casting which needs no further correcting or finishing. The garments of the divinity represented are elaborately covered with a damask pattern of exquisite inlaid work. The process by which this is done differs according to the nature of the material on which it is produced. Sometimes the design is hollowed out to a certain depth with a graver or chisel, and the ornamenting metal, silver, gold, etc., generally in the shape of threads, is laid into the hollow spaces and hammered over, should the alloy be soft enough. The edges of these grooves are first slightly driven up, so that, when the metal has been laid in, they can easily be hammered down again, thus confining the latter in place. Or else the surface is merely covered in the required places with a narrow network of lines by means of filing, and the thin gold or silver leaf fastened on to this rough surface by hammering. When astrology was a living and not a very dead science, as it now is, those who credited its teachings likewise believed that certain persons were possessed of wonderful powers, which enabled them, when they looked into a crystal globe, of seeing future events transpire. We doubt if the Japanese have any similar superstition; but unless they have, there is no obvious use to which their magnificent crystals (two of which we represent) can be devoted, outside of ornamental purposes. The smaller crystal is cut in pear or fig shape, and is surrounded by strangely twisted ivory leaves. The larger one is a perfect sphere, some seven inches in diameter. Both are mounted on superbly lacquered stands. The small crystal is valued at $800, and the larger at $1,000.

THE RUSSIAN GOLD AND SILVER WORK

we have already quite fully described in our notes on the Centennial during its progress. The sketch represents a salver and bowl of ornamented silver gilt, over which exquisite fringed or lace-bordered napkins, of some silver tissue, appear to be thrown. Close examination shows that the napkins are no fabric, but are solid metal, forming in one case a part of the salver, and in the other the cover for the bowl. Every thread of the texture, or of the lace border, even a colored edging pattern, is copied with minute accuracy; and the perfectly natural falling of the folds adds to a deception which can scarcely be discerned save by touch.

Two very curious

EMU EGG ORNAMENTS

are also depicted. The egg looks as if made of dark green morocco leather, and is about five inches in its long diameter. After removing the contents, the Australian jewelers mount them in silver in very tasteful designs. In one the egg is supported on the twisted trunks of palm trees, and ferns rise up on either side. On top, an Australian aboriginal native is standing. The other design introduces the emu and the kangaroo, while the egg is supported by a kneeling figure.

PORTUGUESE WATER MONKEYS

are universally used in all hot countries where ice is a luxury not to be obtained save at ruinous prices. They are vessels of unbaked clay, perfectly porous, and made in the form shown. The larger is intended to hang in a window or wherever a draft of air can be had, so that the evaporation which takes place on the exterior of the vessel may be hastened, and the water within thus more rapidly cooled. The other jar is of the kind which usually replaces the pitcher on the table. The ornamentation of the exteriors is quite tasteful, although the design is merely scratched in.

A curious growth of wood is also represented in the engraving. The material appears to be a species of vine which has been trained and its parts united so as to form a perfectly formed screen or trellis. Lastly, we give sketches of Young Africa's playthings, which show that the youthful denizen of the Gold Coast demands toys not a whit less realistic than his civilized brethren of the rest of the world. Besides, there is a good deal of crude talent exhibited in the carving. The leopard, for instance, with an unknown animal of incognate species in his mouth, shows far greater skill in carving and knowledge of anatomy withal than the frightful spotted horses or jointless-legged cats wherewith Young America amuses himself. The animal, it will be observed, stands at bay, lashing its sides with its tail and holding its prey in its mouth. His spots are burned on with a hot iron. The bird shows a similar imitative ability; the doll, we cannot say so much for; but here the baneful influence of the vices of civilization affect the untutored intellect, for a bit of English or American calico is added to form a very obvious crinoline.

Correspondence.

The Duration of Vulcan's Transit.

To the Editor of the Scientific American:

The distance from the sun of an intra-Mercurial planet, to be in proportion with the grade of solar distances of other planets, ought to be in the neighborhood of 20,000,000 miles, at which distance Kepler's third law would determine the periodic time of the planet to be about 35 days. Assuming these figures to be substantially correct, and the supposititious planet to have an orbit similar in shape to those of other planets, it would move through about 2° of its orbit while passing centrally across the solar disk, the duration of which transit could not much exceed five hours time.

These figures are roughly calculated, but they indicate the impossibility of Vulcan's remaining upon the sun's face as long as the periods suggested by some of your correspondents. To make the duration of transit fifteen hours would be to locate Vulcan's orbit outside that of Venus.

Rochester, N. Y. E. B. WHITMORE.

The Scientific American Supplement.

We are in the frequent receipt of enquiries like the following:

"*Publishers of Scientific American*:

You advertise to furnish the SCIENTIFIC AMERICAN and SUPPLEMENT for one year, postage prepaid, for *seven dollars*. Having already sent my subscription for the SCIENTIFIC AMERICAN, $3.20, I would like to know if, by now forwarding the balance of $3.80, you will send the SUPPLEMENT along? J. H."

Answer: Yes. Any person now a subscriber to the SCIENTIFIC AMERICAN, by remitting to us the difference between seven dollars and the amount he has already paid to us, may receive the SUPPLEMENT for one year: dating from No. 1 of the SUPPLEMENT or from the present time, as he prefers. We can furnish all the back numbers. In addition to the large quantity of illustrated information pertaining to all the various branches of Science, the SUPPLEMENT for 1876 will be especially valuable for preservation as a general pictorial and scientific record of the great Centennial International Exhibition.

Intelligence the Key to Success.

"It may be laid down as a general rule that, in any business, whether it be in trade, in mechanics, or manufacturing, the intelligent educated man will be the most apt to succeed. Of course there are exceptions, but they only prove the truth of the general rule. And by this we do not mean the collegian or the man liberally educated in the schools, for as a general thing they are not the men we find in shops and factories. But we do mean those mechanics and proprietors or superintendents of manufacturing establishments who make it a point to improve upon their common school education by judicious reading and study, by which means they keep themselves posted upon all the improvements and advances made, not only in the industries generally, but especially in that particular industry in which they are personally interested.

"For several years past our business has brought us into frequent contact with manufacturers in almost every branch of industry, and we have observed closely the general intellectual status of this large and growing class of our population. There are two classes of manufacturers occupying opposite extremes—those devoting all the time they can spare, or even more, to the acquisition of mechanical information—in some instances, perhaps, to the neglect of the practical business details of their calling; the other class, which is much the larger, refusing or neglecting to avail themselves of the information furnished by those publications and journals devoted exclusively to mechanical, manufacturing, and scientific subjects. They claim that they have no time to spend in reading papers—no time to waste in the pursuit of knowledge. Indeed they rather boast that, although they have subscribed for some paper devoted to mechanical, scientific, and useful information, they have not even opened it for months, and not unfrequently they will point to a dust-covered pile of unopened papers, with a smile of self-satisfied pride, as an evidence of their independence of all editorial or extraneous assistance. Such men forget that this is an age of progress—that nearly all our manufacturing industries are in that transition state, as it were, between a hopeful opening and a full fruition of final success. Improvements in methods, improvements in machinery, and improvements in products are constantly being made; and the manufacturer who neglects to keep himself posted on all such matters not unfrequently deprives himself of the information and experience of others, that would contribute largely to his own success. Intelligence is one of the first essentials to the successful prosecution of profitable industries; and the proprietor or manager of extensive manufacturing establishments, who goes on the assumption that he already knows all that is worth knowing in relation to the industry in which he is engaged, will be apt to find himself, in the long run, left far behind in the race by many who have started out later in the day and under far less favorable circumstances, apparently, who have availed themselves of all the aids offered to keep fully up with the march of improvement.

"The growth and progress of manufacturing industries in this country have been stimulated and urged on to their present development largely by the advocacy and encouragement of editors and writers who have given their whole time and talent to the study and investigation of the subject in all its bearings—who have accumulated a vast amount of valuable, practical as well as theoretical, information, that can only fail of its object to benefit and advance the cause to which they are devoted by want of application by those for whose advantage it was collated, digested, and prepared. The ancients had a saying which, literally translated, reads: 'Life is short but art is long.' The range of knowledge, information, or intelligence is so extensive that one man can hardly expect, or be expected, to cover the whole ground. Hence we have a variety of journals or publications devoted to a variety of subjects, covering a variety of fields of thought, study, and investigation. First of all comes the newspaper devoted to the current events of the day. This, of course, every intelligent citizen, whatever his calling or occupation, should read. After that come political, literary, scientific, religious, industrial news, etc. And this latter class is still further divided into agricultural, mechanical, manufacturing news, etc. These journals are, or should be, conducted by men of intelligence, of careful and thoughtful study—men who honestly and earnestly labor for the advancement of the special interest to which they are devoted. It would be a libel on human nature to suppose that such an editor would not collect, collate, and present many useful and practical facts and much valuable information that could not be otherwise obtained. The men, or class of men, for whose especial benefit or edification such information is prepared, who, through ignorance, prejudice, self-sufficiency, or any other cause, ignore and disregard it, neglect their own interests and punish themselves much worse than they do the editors whose labors they treat so cavalierly. In this age of the world, ignorance will not win in the race with intelligence, though circumstances may, for the time being, seem to be in its favor.

"There are undoubtedly many persons involved in the care and anxiety of the management of a manufacturing establishment who honestly think they have not the time to read and study a journal published in the interest of their special calling, no matter how able or valuable it may be. But that should not be the case, and if it is, that fact alone shows the necessity for the very information they refuse to accept. It shows that there is not a wise division and disposition of time. One of the most important factors in the problem of successful management of any business is system, method: a time for everything and everything in its time, as well as 'a place for everything and everything in its place.' It is only the man of intelligence who is capable of so systematizing his time and his business as to make both yield the most satisfactory results. The man who is always in a hurry, always just a little behindhand, so that he feels anxious and fearful lest some important matter will not be accomplished in its own time, may calculate that his system is at fault, and that it is not more time that he needs, but a better and wiser disposition of the time he already has.

"The earnest and honest manufacturer who sets out to build up a great, flourishing, and profitable industrial establishment will avail himself of all the information that can be gleaned from the journal, or journals even, devoted to the particular industry in which he is engaged. And in the term 'journals' we do not include that numerous brood of advertising sheets that, under high-sounding titles, are circulated gratuitously and at random, to whomsoever will take them from the post office. Though sometimes containing a few well selected or pilfered articles to give them the appearance of what they are not, reliable journals, they are not edited with that care and ability which alone gives the special journal any value, or any claim to the support of the class to whose interests it is devoted. We earnestly commend these facts and ideas to the great multitude of workers in the industrial fields of the West, in whose interests we have enlisted, and to whose complete success we look forward with hope and gratification."—*Western Manufacturer.*

The United States Skate Trade.

It was not many years ago when all the skates used in the United States came from abroad, chiefly from Germany, and the German skate importation was a lucrative branch of trade. Of late this has almost entirely ceased. The Americans make their own skates now, and, oddly enough, the announcement is made that one of their leading skate factories, the Northampton Skate Company, in Massachusetts is filling orders for nickel-plated skates to be sent to Germany.—*Ironmonger.*

A Fortune in Toothpicks.

It seems that it was not the invention of the wooden toothpick, *per se*, that netted the inventor $50,000, but the idea of making the toothpicks out of soft, brittle wood. It it is said that, when first brought out, the toothpicks were made of hard, fibrous wood; but the inventor soon found that this would not pay, as the picks lasted too long, and he went to pine. It now takes four sound picks to get the broken end of one out from between the teeth; and it is the latter discovery that is said to have realized the inventor his fortune.

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THE PRACTICAL RESULTS OF THE ENGLISH ARCTIC EXPLORING EXPEDITION.

We have before us the connected and detailed narrative of the English expedition, which has lately returned from the arctic regions. A general outline of the voyage we have already presented, noting the fact that the sledge parties from the Alert had reached the highest northern point ever attained, and only turned back when further progress toward the pole became impossible owing to the roughness of the ice and the terrible cold. The official report of the attempt says that, instead of land extending far towards the north, as reported by the Polaris, Robeson Channel opens directly into the Polar Sea. The Alert rounded the northeast point of Grant Land, but, instead of finding a continuous coast line leading one hundred miles further towards the north, as everyone had expected, found herself on the border of what was evidently a very extensive sea, with impenetrable ice on every side. No harbor being obtainable, the ship was secured as far north as possible, inside a sheltering barrier of grounded ice, close to the land, and there she passed the winter. During her stay of eleven months no navigable channel of water permitting further advance to the northward ever presented itself. Instead of finding an "open Polar Sea," the ice was of most unusual age and thickness, resembling, in a marked degree, both in appearance and formation, low floating icebergs rather than ordinary salt water ice. It has now been termed the "Sea of Ancient Ice"—the Palæocrystal or Palæcruic Sea; and a stranded mass of ice broken away from an icefloe is named a floeberg.

Whereas ordinary ice is usually two feet to ten feet in thickness, that in the Polar Sea, in consequence of having so few outlets by which to escape to the southward in any appreciable quantity, gradually increases in age and thickness until it measures from 80 feet to 100 feet, floating with its surface at the lowest part 15 feet above the water line.

Strange as it may appear, this extraordinary thickness of the ice saved the ship from being driven on shore; for, owing to its great depth of flotation, on nearing the shallow beach it grounded and formed a barrier, inside which the ship was comparatively safe. When two pieces of ordinary ice are driven one against the other and the edges broken up, the crushed pieces are raised by the pressure into a high, long, wall-like hedge of ice.

When two of the ancient floes of the Polar Sea meet, the intermediate lighter, broken-up ice, which may happen to be floating about between, alone suffers; it is pressed up between the two closing masses to a great hight, producing a chaotic wilderness of angular blocks of all shapes and sizes, varying in hight up to 50 feet above water, and frequently covering an area upwards of a mile in diameter.

Such an icy road, which was sure to be continuous, destroyed all hope of the pole itself being reached by sledges. Commander Markham and Lieutenant Parr were, however, absent seventy-two days from the ship; and on May 12 succeeded in reaching latitude 83° 20′ 26″ N., as marked on the annexed map. From this position there was no appearance of land to the northward, but, curiously enough, the depth of water was found to be only seventy-two fathoms.

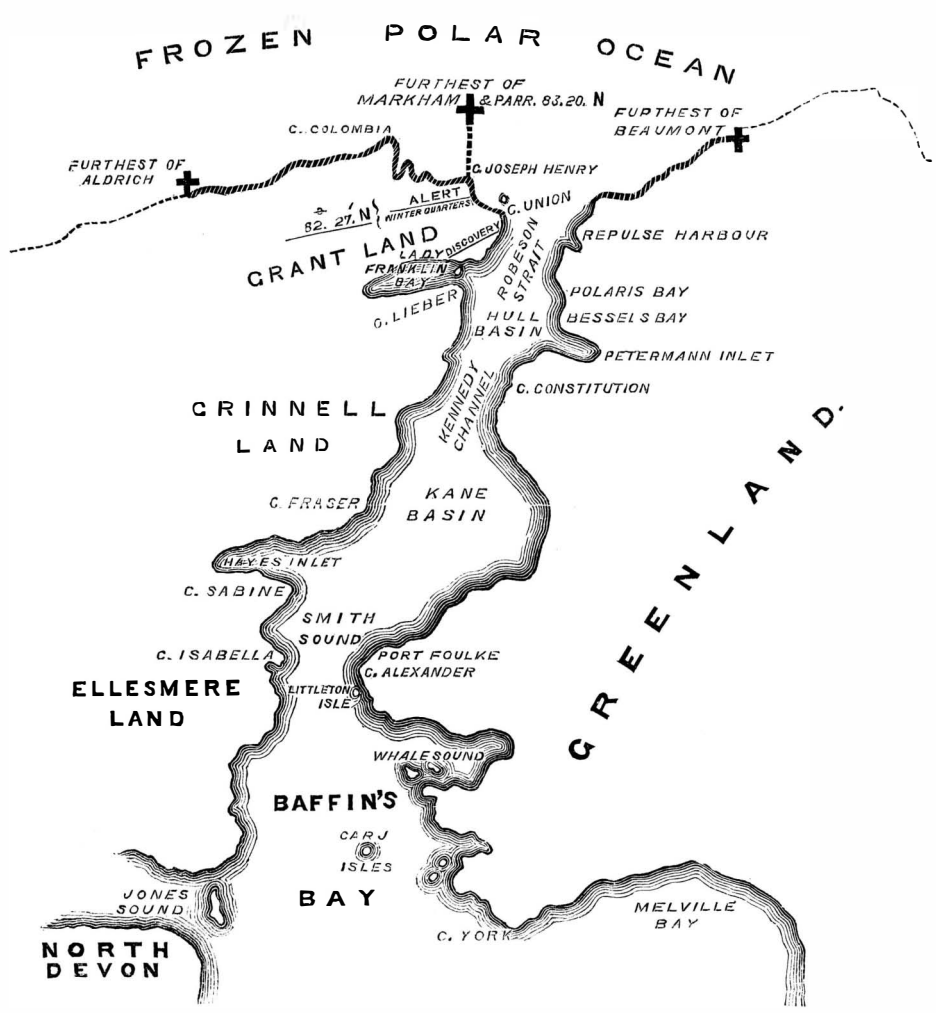
In addition to the dispatch of the northern travelers, the coast line to the westward of the Alert's position was traced for a distance of 220 miles by a party under the command of Lieutenant Aldrich; the extreme position reached was in latitude 82° 40′ N., longitude 86° 30′ W., the coast line being continuous from the Alert's winter quarters. The most northern land, Cape Columbia, is in latitude 83° 7′, longitude 70° 30′ W.

The coast of Greenland was explored by traveling parties from the Discovery, under the command of Lieutenants Beaumont and Rawson. They succeeded in reaching a position in latitude 83° 18′ N., longitude 50° 40′ W., 70 miles northeast of Repulse Harbor. The land extended as far as latitude 82° 54′ N., longitude 48° 33′ W., but very misty weather prevented its character being determined with exactness. Lieutenant Archer, with a party from the Discovery, explored Lady Franklin Sound, proving that it terminates at a distance of 65 miles from the mouth, with lofty mountains and glacier-filled valleys to the westward. Lieutenant Fulford and Dr. Coppinger explored Petermann Fiord, finding it blocked up with a low glacier, which extends across from shore to shore. With the exception of Hayes Sound, the coast line of Smith Sound has now been explored from north to south.

When all had come back to the ships, Captain Nares found that the sufferings had been terrible, that the work achieved was unsurpassed in the annals of discovery; but he also found that the heroic devotion of officers and men had secured for the expedition complete success. The work was done, and he was able to decide upon returning to England. While the pole had, it is true, not been reached, the impracticability of any one ever attaining it had been placed beyond doubt.

We have noticed that because Captain Nares did not accomplish the discovery of the pole, which by common consent rather than through any scientific reason is considered the goal of all arctic expeditions, his work has been hastily pronounced a failure. This is not only unjust but unfounded; for the expedition really accomplished all it started to perform, namely, the exploration of the region adjacent to the pole, and only ceased when insuperable difficulties and the practical completion of its task rendered further labors both impossible and unnecessary. Mr. Clements R. Markham sums up its splendid achievements as follows:

First, a great Polar Ocean has been discovered and fully described, which will revolutionize most preconceived ideas, and a knowledge of which will be most valuable to the science of hydrography. Next, a coast line, stretching from 50° of longitude along the Polar Ocean, has been discovered and carefully delineated; and an exhaustive knowledge of its geology, fauna, and flora has been obtained. The long channel, from Smith Sound to the Polar Ocean, has also been carefully delineated, and the shores on both sides have been explored and described. Most important discoveries have been made with reference to the geology of the unknown area, the value of one of which—namely, the former existence of an evergreen forest in 82° 44′ N.—is alone worth all that has been expended on the expedition. In zoology and botany the results are equally valuable, especially as regards the distribution of plants and animals. Add to this that complete series of observations, at two separate stations, have been recorded in meteorology, magnetism, tides, electricity, and spectrum analysis: besides other results not yet reported.



MAP OF THE COURSE OF THE BRITISH POLAR EXPEDITION.

Business Precepts.

We find it stated that the founder of the great banking house of Rothschilds made the following rules the guide of a business career culminating in magnificent success:

1. Combination of three profits. "I made the manufacturer my customer, and the one I bought of, my customer; that is, I supplied the manufacturer with raw materials and dyes, on each of which I made a profit, and took his manufactured goods, which I sold at a profit, and thus combined three profits."

2. Make a bargain at once. Be an off-handed man.

3. Never have anything to do with an unlucky man or place. "I have seen many clever men who have not shoes to their feet. I never act with them. Their advice seems very well, but fate is against them; they cannot get on themselves, how can they do good to me?"

4. Be cautious and bold. "It requires a great deal of boldness and a great deal of caution to make a great fortune, and when you have got it it requires ten times as much to keep it."

A Fish of Seven Colors and Three Tails.

Mr. Gill, of Martin, Gillet & Co., of Baltimore, Md., has just returned from Japan, bringing with him a beautiful and rare fish, never before seen in this country, and which he has kindly loaned to the New York Aquarium. The peculiar features are several brilliant colors and three separate and distinct tails, all of which the Japanese claim are the result of many and successful years of the most careful breeding. A number of attempts have been made to introduce this fish into American waters, but this is the only instance of success. A tank, suspended like a compass, to avoid the ship's motion, was especially constructed, and then, notwithstanding the greatest care, attention, and constant watching, out of eighty-eight only seven survived the journey. The remaining six that Mr. Gill has have spawned, resulting in fifty young fry, which exhibit all the peculiarities of the originals. It is Mr. Gill's intention, as soon as he has a sufficient stock, to give some of them to persons who will endeavor to raise them. The fish loaned to the aquarium is a magnificent specimen, and exhibits all the several beautiful colors in perfection.

What British Hardware Manufacturers Have to Do.

The last number of the *Ironmonger* takes the British manufacturers to task for not furnishing what the people demand, and admonishes them, if they expect to retain their trade, to adopt the plan of supplying the article the consumer requires. "Many old patterns will have to give way in this country," it says, "in favor of more handy goods in frequent use throughout the New World. The essence of the American's success consists in the fact that he always supplies just what the consumer wants, or thinks he wants, and that he supplies the want promptly. While an Englishman cannot for the life of him sacrifice stock, the American, who, as a salesman, is frequently 'two or three hours ahead' of our own countrymen, does so without compunction. Only let him see his opportunity, and he will not hesitate a moment. Of this an instance was recently recorded in the method of dealing by two traders of different nationalities, who were selling goods required by the miners at the gold diggings. The articles were dippers, and they were supplied by the hundred by an English and an American firm respectively. When the goods were delivered upon the ground, the tide of popular opinion had turned, and something different was wanted. The American tossed all his dippers into a shed and thought no more of them; in less than a week he had a supply of new dippers on the ground. Not so the Englishman; he persisted in trying to sell what he had got, and refused to sell anything else. 'Is it a matter of surprise,' it is asked, 'that the American did a roaring trade, while the Britisher retired in disgust?' Why have we lost the ax trade? Because the English ax makers were too proud or too indolent to take a lesson from the Americans, who, utilizing their great experience in the use of such a tool, have produced the best possible instrument for the purpose. Doggedly the English ax maker has gone on making an imperfect tool, and has forced the consumer at home as well as abroad to buy oftentimes reluctantly, the American product. Less than ever can we afford to repeat that and other mistakes which are now occurring in a not dissimilar line of business; for it will most certainly come about that additional agencies will be opened in this country for supplying such goods. Even at this moment the electroplate goods of a leading electroplate company of America are being sold in Birmingham; and through a central agency there, what are known as 'Canadian' gold Albert chains, which are really excellent goods of United States make, are being sold throughout the whole of England. Established English ironmongers have a right to look to English hardware firms to supply them with goods that the English people may demand, without driving them to resort to present or future American agencies, either in Birmingham, Liverpool, or London."

To Distinguish between Cotton and Wool in Fabrics.

Ravel out the suspected cotton fiber from the wool and apply flame. The cotton will burn with a flash, the wool will curl up, carbonize, and emit a burnt, disagreeable smell. Even to the naked eye the cotton is noticeably different from the filaments of wool, and under the magnifier this difference comes out strongly. The cotton is a flattened, more or less twisted band, having a very striking resemblance to hair, which, in reality, it is; since, in the condition of elongated cells, it lines the inner surface of the pod. The wool may be recognized at once by the zigzag transverse markings on its fibers. The surface of wool is covered with these furrowed and twisted fine cross lines, of which there are 2,000 to 4,000 in an inch. On this structure depends its felting property. Finally, a simple and very striking chemical test may be applied. The mixed goods are unraveled, a little of the cotton fiber put into one dish and the woolen in another, and a drop of strong nitric acid added. The cotton will be little or not at all affected; the wool, on the contrary, will be changed to a bright yellow. The color is due to the development of a picrate.

ONE per cent of lime with silica makes the most infusible brick known.

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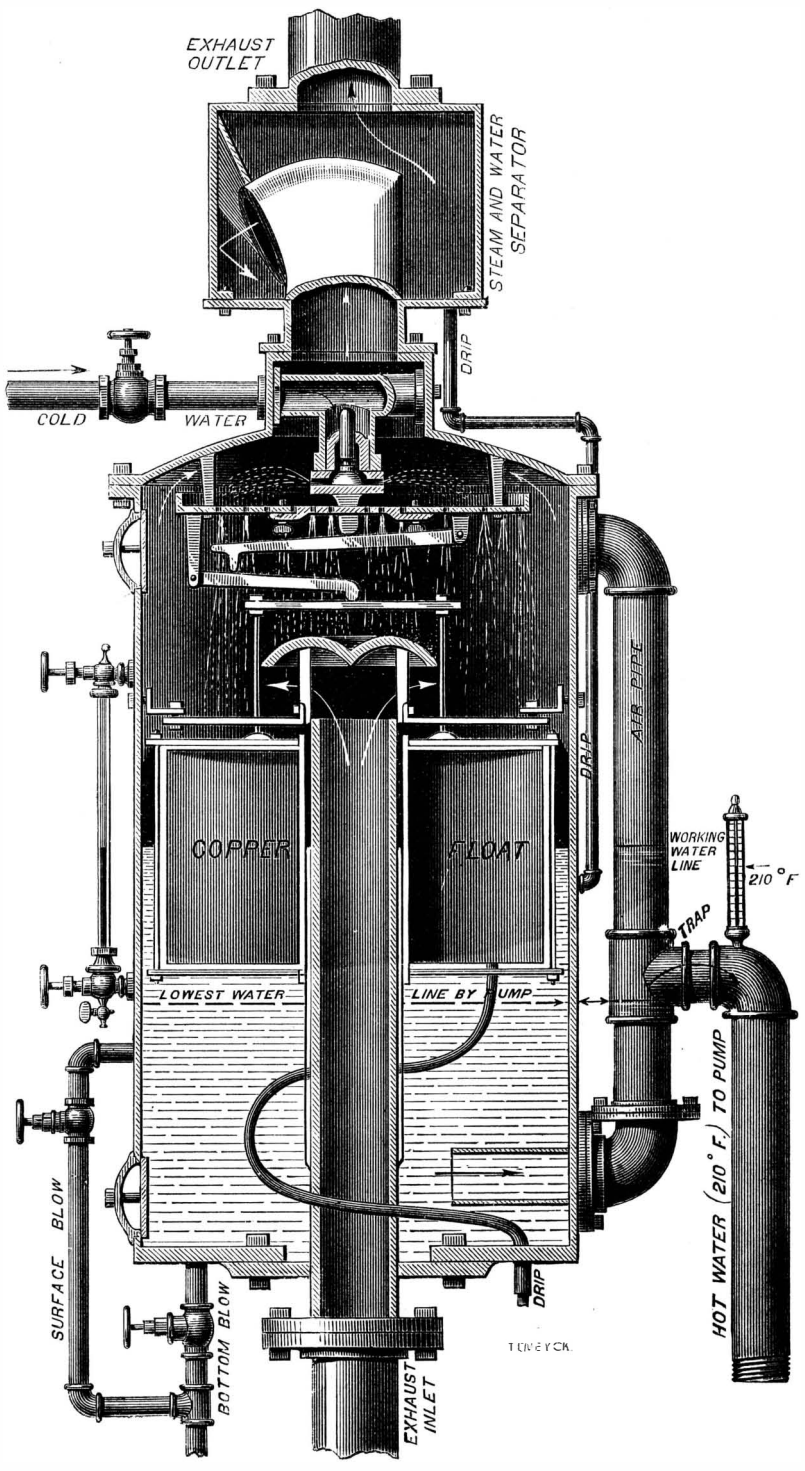
IMPROVED FEED WATER HEATER.

We illuatrate herewith a new self-regulating feed water heater, the operation of which will be readily understood from the following description: Referring to the illustration, the cold water enters through its pipe to the valve, a little above the perforated plate. This valve rests upon levers connected with the float, seen below, which effectually controls it. The water escaping from the valve passes through the perforated plate in the form of rain or spray. The exhaust steam, entering from below through the large central pipe, strikes the deflecting disk at its top, and is directed against the rain or spray falling from the perforated plate, heating it, it is claimed, instantaneously to the boiling point. The steam then passes around the perforated plate to the steam and water separator on top, where it drops any water it may have taken up, and passes to the exit well dried. The water thus collected travels through a drip pipe to the bottom of the heater. The heated water in the bottom of the heater passes to the pump through the pipe on the right. It will readily be seen that whenever, from the shutting off of the main or from any other cause, the water is pumped down, it cannot fall below the line marked "lowest water line by pumping," as when that line is reached the pump draws air and steam through the air pipe. The object of this arrangement is to collect any oil or floating dirt above this outlet to the pump, where it can be drawn off nightly through this surface blow, and any heavy dirt below the outlet, where it can be drawn off weekly through the bottom blow. The float is substantially made, and gives no trouble; but as an additional precaution, a spiral drip pipe is used, which preserves its buoyancy unless it leaks more than the pipe can carry off. The float and the plate seen above it also act as pacificators, and prevent the constant turmoil of the water, so that in practical operation the level of the water does not vary over one half inch.

It is claimed that this apparatus, using exhaust steam only, will heat over three times the water needed for the purpose of making steam for power to an unvarying temperature of 210° Fah., no matter how fast the water may be pumped. It is also entirely self-regulating and requires no attention. A thermometer for testing is attached to and furnished with each heater, and a trial of thirty days is allowed. We are informed that the apparatus has been in successful operation for the past eighteen months. The Brooklyn navy yard is using one, the government tests showing, it is stated, a gain of thirty per cent in heating power over their tubular heater. The engineer of the New York Post Office building testifies to a saving by the two in use there of twenty-two per cent by actual weight. One in the Equitable Life Insurance building shows a saving of about eighteen per cent, and others in use by private parties show like advantageous results.

For further information apply to the Green Feed Water Heater Company, 86 Liberty street, New York city.



GREEN'S FEED WATER HEATER.

IMPROVED FURNACE FEEDER.

Years ago Dr. Arnott taught us that the proper method was to light a fire from the top and let it burn downwards, consuming the gases as they were evolved; and in accordance with this view, he invented a domestic grate for charging at the bottom. Mr. Frisbie's patent feeder, represented in the annexed engraving, which we select from the pages of *Iron*, is designed to accomplish the same object in furnaces and the fire grates of steam boilers.

The accompanying engravings are longitudinal vertical sections, Fig. 1 showing the charging cylinder in a vertical position and with the piston raised; while Fig. 2 shows the cylinder brought back to an inclined position and filled, with the piston at the bottom. In place of the usual fire bars is a central aperture, surrounded by segmental gratings, which are easily removable, while the whole annular arrangement of grate bars runs on friction rollers, like a turntable, and may be rotated by means of a crowbar inserted in the holes for that purpose. Underneath the central aperture is hung the cylinder or hopper, swinging on pivots, and provided with a movable bottom or piston. This cylinder is supported by side plates working in bearings on the floor of the furnace; and, after being filled in the inclined position, is brought up to the vertical by one set of arms and crank pins on the crank shaft, taking into notches in links jointed to the supporting plates. The crank shaft is driven by means of the hand winch and bevel gearing; and when the cylinder has reached the full extent of its swing, which brings it directly underneath the central circular aperture, the crank pins leave the notches, and the links then rest upon the shaft, thus locking the hopper in a vertical position. By a continued turning of the winch handle, the crank of the shaft, which is provided with a friction roller, now comes into contact with another set of arms on the shaft, which raise the piston with its charge of fuel to the top of the cylinder, thus causing the fresh charge to displace the previous one (shown at Fig. 2), and propel it into the incandescent mass above. Turning the handle in the contrary direction has the effect of bringing the cylinder back to the inclined position, the crank pin of the first set of arms taking into the notches, and disengaging the links by raising them. A cast iron apron follows the cylinder up, so as to retain in its place the coal just charged into the furnace. The piston remains at the top of the cylinder until it has passed the opening in the center, when it is released by a catch coming in contact with a cross bar, and falls to the bottom of the cylinder, ready for a fresh charge of fuel.

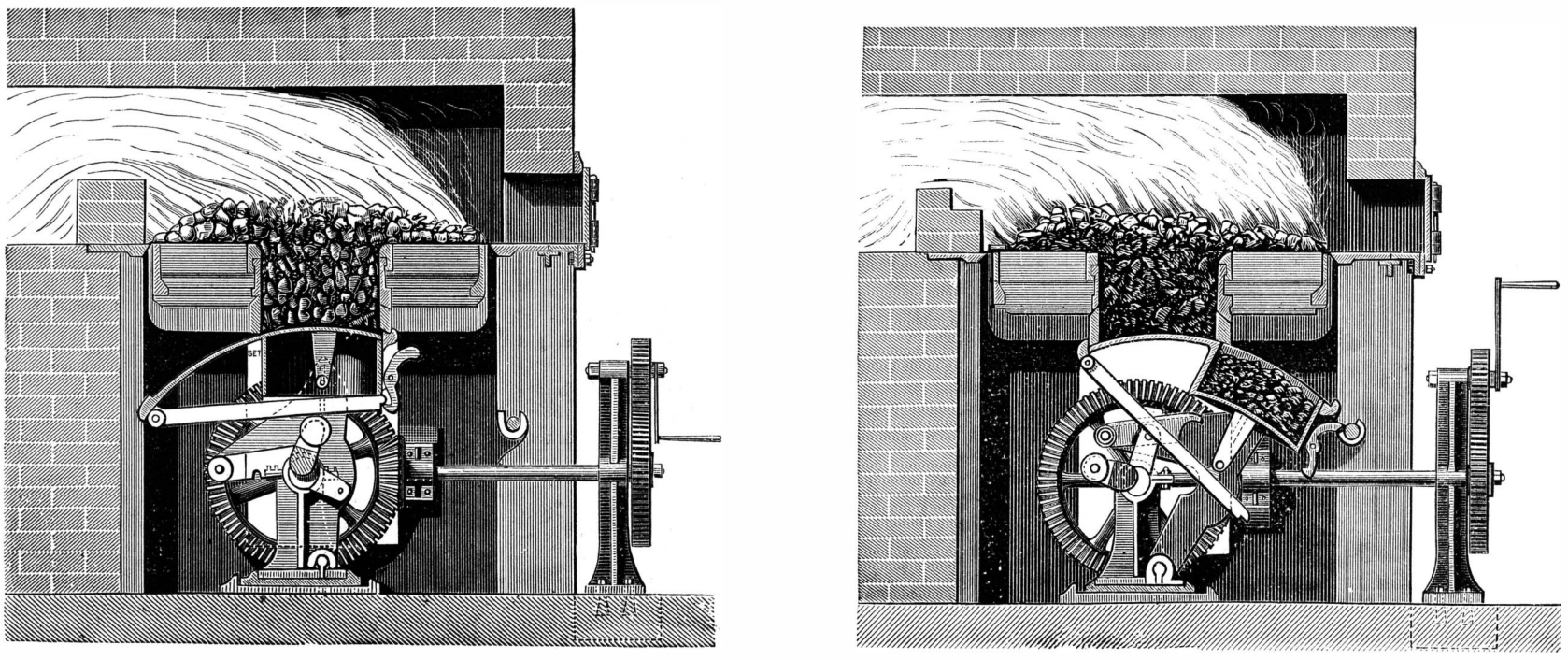
It is claimed that, by this arrangement, the gases evolved from the coal cannot escape without being consumed; and so perfect is the combustion that nearly all the residuum forms a fine ash, which falls between the bars on their being moved round. Any clinker or incombustible substance contained in the fuel is continually lifted and loosened, and gradually carried to the circumference of the grate by the successive charges of fresh fuel forced up in the center, and may be removed from all portions of the grate by its being brought, in its revolution, opposite the fire hole door. Raking of the bars is entirely superseded, and the fire door need be opened only rare occasions. Again, the stoker is completely protected from the violent heat, and has a much less laborious task than in hand stoking. There is no fear, as might at first be supposed, of the cylinder being melted by the heat; the fact is that it does not come in contact with the fire itself, but only with fresh coals. The draft through the grating also tends to keep the gear cool. We learn that there are already over thirty of the feeders now in use in Birmingham, England.

Explosion of Benzolin.

Persons who have occasion to repair barrels which have contained naphtha, benzole, or any of the light petroleum oils should be careful how they use a light or even a hot iron about their work. A Mr. Bower, of Sheffield, England, had in his cellar an empty benzolin cask which needed to be repaired, and in doing it he, with singular indiscretion, applied a red hot solder iron to the inside. The spirit or gas which still remained in the barrel exploded with great violence. Mr. Bower escaped with a good fright; but the globes and glass in his shop were smashed, a skylight was blown out in the back kitchen, and other damage was done.

Fig. 1.

Fig. 2.



FRISBIE'S FURNACE FEEDER

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SEA SERPENTS.

There have been so many "mariners' yarns" told about gigantic sea serpents that few believe that any true member of the snake family ever lives in the sea, despite the fact that in our temperate climate there are many of the reptiles known as water snakes which are rarely met with except in ponds and marshes. The truth is that there are sea serpents, to be sure not colossal monsters with heads as big as hogsheads, and capable of crushing small vessels in their vast folds, but moderate-sized snakes, growing sometimes to a length of over nine feet, but generally about half that. The family of thantophidians to which they belong has only seven genera and about twenty species, and is indigenous to the Indian Ocean and archipelago. The serpents have flat tails and a compressed body, perfectly adapted to their aquatic existence. They are, in fact, compromises between snakes and eels. Like snakes they are venomous, and their bite is often deadly, although their poison loses its power after the reptile has been out of water a few days. The jaws and teeth are smaller than those of land serpents of the same dimensions. The head is always small. The body changes its form according to the season of the year, being sometimes long and thin, again short and thick.

THE HYDROPHIS.

The serpents belonging to the genus *hydrophis* are nearest allied to their land brethren, and one especially, the *platura*, appears to be a connecting link between the two orders. Its general conformity and its large ventral scales all indicate an animal capable of locomotion on the and as well as in the water. The food of the family—one member of which is well represented in the annexed illustration, from *La Nature*—is fish, crustaceans, and small turtles, which they kill by their venomous bite. A curious fact is that the snakes in time become literally covered with barnacles, as when these parasites affix themselves to their bodies the serpents make no attempts to remove them.

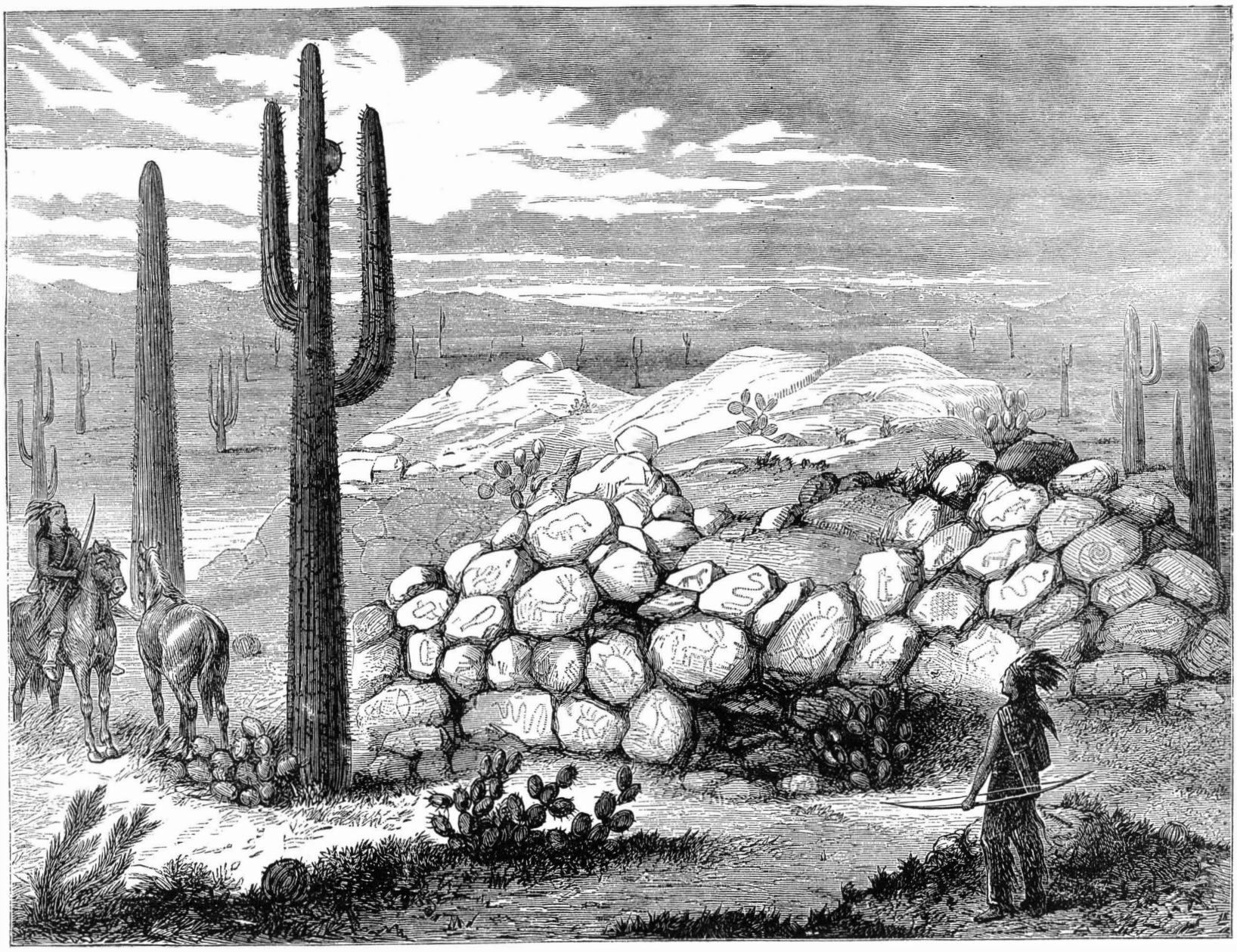
PREHISTORIC RELICS IN ARIZONA.

Arizona Territory is perhaps less known, to the majority of our inhabitants, than any other part of the country; and yet it has a remarkably fine climate, moderate temperature, fertile soil, and unbounded mineral wealth. No railways, however, have as yet been constructed in Arizona; but the Atlantic and Pacific and the Texas Pacific companies have obtained charters and land grants, and, when these roads are constructed, there is every likelihood of this beautiful region being reached by settlers from the East; and its lands, now chiefly occupied by nomadic tribes of Pimas, Maricopas, Mohaves, Utes, and Apaches, will be brought into cultivation.

To the traveler and antiquary, Arizona is a land possessing especial interest, as it abounds with relics of two populations, probably widely separate in point of time. There are to be found here numerous ruins of Aztec sculptures and buildings, which were probably of great antiquity when Cortes arrived in Mexico, and Don José de Vasconcellos crossed Arizona towards the Great Cañon, in 1526. But the remarkable painted rocks, shown in our illustration, are doubtless much older than the Aztec relics; and there is no history, legend, or tradition that even attempts to explain the origin of the inscriptions. The marks are not painted but scratched on the surface of the rock, which is a kind of gritty sandstone, of red color; and many of the animals thus rudely depicted are not, and perhaps never have been, indigenous to Arizona. The alpaca, for instance, belongs to the uplands of South America; and the buffalo's native land is far to the northeast of these rocks. It seems reasonable, therefore, to believe that the inscriptions were part of an account of some travelers' wanderings, who thus recorded news of the remarkable countries they had visited.

The pitahiya, or giant cactus, several specimens of which are shown in our engraving (which we select from the pages of the *Illustrated London News*), sometimes reaches the hight of seventy feet. It has a curiously weird appearance, with its huge pronged branches looming in the distance. The fruit is a favorite food with the natives, who knock it down from the trees with arrows. They also use the fibers of the trunks, matting them together to roof their wigwams with.

The Aztec relics are very numerous on the Colorado plateau, in the northwestern part of Arizona; and the Spaniards subsequently erected reservoirs, terraces, and buildings of great extent. Stone fortifications are also very frequently met; and it has been estimated from such indications that at least 100,000 people inhabited the Gila valley at one time. It is probable, moreover, that some further light may be thrown on the history of this wonderful region, as much of the northern part of the country has never been explored.



THE PAINTED ROCKS, ARIZONA TERRITORY.

FOR KEEPING crackers dry, unslaked lime is recommended. The wooden boxes for the crackers should be about 12 inches deep, and have a tray 1 inch deep to rest just beneath the lid, which should fit tightly. The lime is placed on the tray, and is said to keep the crackers dry for six months if the box is not opened, or for about two months if the box is visited daily.

THE *Herald of Health* says that the right way to cook an egg is to pour water on it at a boiling temperature and leave the egg there for fifteen minutes.

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CENTENNIAL NOTES.

AFTER THE FAIR.

The dismantling of the Great Exposition is being pushed forward with great rapidity, and the scene in the grounds reminds one of the busy haste incident to the week prior to the opening. Freight cars, wagons, and trucks, loaded with filled boxes, are everywhere; the machinery is motionless, and much of it is taken apart and covered with white lead; on such of the State buildings as are not sold (but most of them are), the placard "For Sale" stares the visitor in the face; and barriers at every hand prevent the accustomed free rambling about the grounds. In the Main Building nearly all the foreign exhibits are fenced in, and admittance to them is denied. The Japanese display is surrounded by a high partition which prevents even the empty cases being seen. The paintings are nearly all packed. Visitors who puzzled over how Markart's immense work was transported may now have their curiosity satisfied by beholding the canvas removed from its stretchers and carefully rolled on a huge cylinder, a proceeding which smaller oil paintings would hardly undergo without cracking. Most of the statuary is to be sold,and some is already advertised to be offered at auction in this city. The Government Building is closed, and a sentry paces his beat in front of the door. Visitors are still admitted to the grounds at the usual price, but they number scarcely 15,000 a day. Bargain hunters are present in full force, there being a prevalent idea that exhibitors will offer their wares at greatly reduced rates rather than remove them. The reverse,however,appears to be the case; and with some exceptions, the exorbitant prices hitherto charged are maintained. To judge from the immense number of objects that were sold during the fair and the sums they brought, visitors must have become imbued with the notion that everything exhibited was unique and unattainable elsewhere. We doubt if there was anything, with the exception of certain works of art and oriental objects, that could not be duplicated in this city or even imported from Europe at a very much less cost. The Italian trinkets, which are sold in Genoa for their weight in silver, were universally purchased at about four times their value; the Chinese porcelain went at about the same ratio as compared with New York prices; and as for the supposed Turkish jewelry,thousands of dollars worth of the spurious trash was bought at at least five times its usual cost. At the beginning of the Centennial, some real Turkish goods were offered for sale; and these Mr. Bayard Taylor probably saw when he wrote the letter to a New York journal attesting their genuineness. That letter was posted conspicuously by the dealers; and under its innocent guarantee, thousands were induced into buying glass and brass which elsewhere they would have scorned, and which now is gladly sold on the grounds at less than half price. The United States government seems to have profited considerably by the generosity of foreign exhibitors, and in this respect to share the advantages with the city of Philadelphia. Nearly every government represented on the grounds has given something to the National Museum, while many have given all and others the greater portion of their specimens in certain departments. Philadelphia has lately been presented with the German Pavilion; and the Jewish statue of "Religious Liberty" which has just arrived, unfortunately too late for the Exhibition, will be set up permanently in Fairmount Park.

The Centennial Commission are finishing the award business,and shortly will adjourn for a period of several months, leaving the entire management in the hands of that less cumbersome body, the Executive Committee. The members of the Commission are determined to completely wind up the affairs of the Exposition just as soon as the accounts can be revised and final reports prepared, and thus creditably to finish their creditable work.

With the close of the Exposition comes the period of statistics, and they are appearing with a frequency that presupposes a pre-eminent popular mathematical taste. We are told that the total number of cash admissions was 8,004,214, and receipts $3,674,883.74. The hotels in West Philadelphia report the accommodation of 2,564,000 guests. The Globe hotel is to be removed to Long Branch, the Atlas will be demolished, and many of the others will be altered back into dwelling houses. The attendance at the Exposition was lowest during the month of May, averaging 19,946 daily; it steadily increased, and during October averaged 102,456. The fund realized by the 15 per cent royalty on beer and soda water amounts to $500,000. The Corliss engine flywheel made 2,355,300 revolutions during the Exhibition. Any point in its periphery therefore traveled an average of 260 miles per day, or 40,147 miles during the entire Fair.

Science in America.

Professor John W. Draper delivered an inaugural address, as President of the newly formed Chemical Society, on the above subject, at Chickering Hall, this city, on the evening of the 15th of November. He began by stating that the progress of Science depends on two elements, our educational establishments and our scientific societies. Briefly sketching the scientific and industrial progress of the century, he said that in 1840 it had become apparent that there was provision in the existing educational establishments for instruction in accordance with the world's advance in substantial knowledge. The colleges clung to the mediæval as long as they could,and only accepted the modern when they were compelled; and generally, the lecturer considered that the sooner colleges emancipated themselves from the mediæval confines of the classics, and assumed thoroughly and sincerely the modern cast of study,the more the cause of scientific progress would be promoted

Dr. Draper then sketched the growth of scientific societies and pointed out the benefits of their organized efforts. He thought that endowment of colleges was a noble disposition of money, but considered that the bestowal of funds on any scientific society was still nobler. The one is a local and transitory benefaction, the other enduring and universal benevolence.

The most important part of the address related to scientific progress due to Americans, and was in answer to many of the addresses made during the last summer on the Centennial occasion, in which the shortcomings of the United States in extending the boundaries of scientific knowledge, especially in the physical and chemical departments, have been set forth. The persons who make these humiliating accusations mistake what is merely a blank in their own information for a blank in reality.

"Perhaps, then, we may without vanity recall some facts that may relieve us in a measure from the weight of this heavy accusation. We have sent out expeditions of exploration both to the Arctic and Antarctic Seas. We have submitted our own coast to a hydrographic and geodesic survey, not excelled in exactness and extent by any similar works elsewhere. In the accomplishment of this we have been compelled to solve many physical problems of the greatest delicacy and highest importance, and we have done it successfully. The measuring rods with which the three great base lines, of Maine, Long Island, Georgia, were determined, and their beautiful mechanical appliances, have exacted the publicly expressed admiration of some of the greatest European philosophers, and the conduct of that survey their unstinted applause. We have instituted geological surveys of many of our States and much of our territories, and have been rewarded, not merely by manifold local benefits, but also by the higher honor of extending very greatly the boundaries of that noble science. At an enormous annual cost we have maintained a meteorological signal system, which I think is not equaled, and certainly is not surpassed, in the world.

"Should it be said that selfish interests have been mixed up with some of these undertakings, we may demand whether there was any selfishness in the survey of the Dead Sea? Was there any selfishness in that mission that a citizen of New York sent to Equatorial Africa for the finding and relief of Livingstone, any in the astronomical expedition to South America, any in that to the valley of the Amazon? Was there any in the sending out of parties for the observation of the total eclipse of the sun? It was by American astronomers that the true character of his corona was first determined. Was there any in the seven expeditions that were dispatched for observing the transit of Venus? Was it not here that the bi-partition of Biela's comet was first detected, here that the eighth satellite of Saturn was discovered, here that the dusky ring of that planet, which had escaped the penetrating eye of Herschel and all the great European astronomers, was first seen? Was it not by an American telescope that the companion of Sirius, the brightest star in the heavens, was revealed, and the mathematical prediction of the cause of his perturbations verified? Was it not by a Yale College professor that the showers of shooting stars were first scientifically discussed, on the occasion of the grand American display of that meteoric phenomenon in 1833? Did we not join in the investigations respecting terrestrial magnetism instituted by European governments at the suggestion of Humboldt, and contribute our quota to the results obtained? Did not the Congress of the United States vote a money grant to carry into effect the invention of the electric telegraph? Does not the published flora of the United States show that something has been done in botany? Have not very important investigations been made here on the induction of magnetism in iron, the effect of magnetic currents on one another, the translation of quantity into intensity, and the converse? Was it not here that the radiations of incandescence were first investigated, the connection of increasing temperature with increasing refrangibility shown, the distribution of light, heat, and chemical activity in the solar spectrum ascertained, and some of the fundamental facts in spectrum analysis developed, long before general attention was given to that subject in Europe? Here the first photograph of the moon was taken, here the first of the diffraction spectrums was produced, here the first portraits of the human face were made—an experiment that has given rise to an important industrial art!

"Those who make it their practice to decry the contributions of their own country to the stock of knowledge may perhaps stand rebuked by the expressions that sometimes fall from her generous rivals. How can they read without blushing at their own conduct such declarations as that recently uttered by the great organ of English opinion, the foremost of English journals? The *Times*, which no one will accuse of partiality in this instance, says: "In the natural distribution of subjects, the history of enterprise, discovery, conquest, and the growth of republics fell to America, and she has dealt nobly with them. In the wider and multifarious provinces of art and science she runs neck to neck with the mother country, and is never left behind!"

Spontaneous Combustion in Coal.

At this season it is advisable to test the temperature of all piles of coal, whether in sheds or out of doors, in order to detect any tendency to heating. The usual method of running down tubes (ordinary inch pipes, sharpened at lower end) from the top of the piles to the bottom, at frequent intervals, will repay for the trouble. Whether in sheds or out of doors, coal is apt to heat, and more particularly so after being stored about three months. In many places, tubes are always kept in the piles, and the temperature taken daily, by lowering a thermometer into them: in this way any accumulation of heat can be easily detected, and the remedy applied before loss is incurred. When undue heat is detected, turning over that portion of the pile is the surest remedy. In several cases of heating that have occurred recently, only the watchfulness and promptitude of those in charge have prevented serious losses.—*American Gaslight Journal.*

Preservation of Timber with Salts of Copper.

Experiments by M. Rottier show that wood impregnated with copper may be long preserved, but will not last underground for an indefinite time. However carefully prepared, it decays after a longer or shorter interval.

So long as the wood contains a certain proportion of copper, it resists decay; when the copper is no longer there, it is in pretty much the same condition as unprepared wood, and speedily decomposes.

Some thin slips of soft poplar wood were carefully dried and afterwards impregnated with a solution of pure copper sulphate, containing 1½ lbs. of crystallized sulphate of copper per 100 lbs. water. It was not found necessary to resort to pressure, as, the wood being very thin, mere immersion sufficed for its thorough impregnation with the antiseptic fluid. The strips were washed several times with plenty of water, and dried. Some were then set apart for analysis, and others buried, in a box filled with ordinary garden mold kept continually moist by repeated waterings. The annexed table shows the results:

——	Length of time the strips were interred.	Proportion of crystallized sulphate of copper found in them.	REMARKS.
	days.	grains.	
15 grains of wood prepared and dried....	0	0·63263	
15 grains of wood prepared and dried...	68	0·38575	Wood still perfectly sound.
15 grains of wood prepared and dried....	117	0·33946	Strips showing a few black spots.
15 grains of wood prepared and dried....	179	0·26231	Wood almost entirely decayed.

Here we see, as plainly as it can well be shown, that the preservation of the wood was due to the presence of the cupreous sulphate; by degrees, as it parted with this metallic salt, it decayed. Now let us consider the causes of removal of the copper. They are three: 1. The presence of iron. 2. The presence of certain saline solutions. 3. The presence of carbonic acid.

Timber prepared with copper is liable to decay when the proportion of the latter contained in it becomes very small. It appears probable that its duration might be prolonged by fixing more copper in the ligneous tissue.

The ordinary method of preparing timber does not permit of the solution of the question; wood plunged in a solution of copper sulphate takes up a pretty nearly constant quantity of the metal; and that quantity is very small. Special processes are requisite to introduce larger quantities of the metal into the tissues.

Ammoniacal copper salts: The use of the ammoniated salts of copper allows of the introduction of large quantities of copper in woody tissue. Numerous experiments showed that wood so prepared contained from 0·255038 grain to 0·112639 grain of copper per 15·43 grains of wood.

It appears, therefore, that there are various ways of impregnating wood with copper in excess of the ordinary proportion. It remains to be seen whether the excess of copper gives a notable increase of durability. To decide this question seven strips of wood were buried in the ground side by side: 1. A strip unprepared, A. 2. A strip prepared with sulphate of copper, B. 3. A strip prepared with acetate, C. 4. A strip prepared with catechu, D. 5. A strip prepared with sulphate and afterwards heated, E. 6. A strip prepared with acetate and heated, F. 7. A strip prepared with cuprammonium sulphate. The results are:

——	15·43 grains of wood contained of Cu So_4 5 H_2O	Wood completely rotted after
	grains.	days.
A. Unprepared wood.....	0·0003086	30
B. Wood prepared with copper sulphate in the ordinary way....	0·0112639	67
C. Wood prepared with acetate of copper.....	0·1543	95
D. Wood prepared with sulphate of copper and catechu.....	0·20059	120
E. Wood prepared with sulphate of copper and heated afterwards.	0·1543	80
F. Wood prepared with acetate of copper and heated afterwards.	0·35489	160
G. Wood prepared with ammoniacal copper sulphate.....	0·255038	130

These results have been confirmed by repeated experiments, in seme of which the prepared slips of wood were found as fresh and sound after an interment of 200 days as when first consigned to the ground.

Of the several methods above described, one only, the employment of ammoniacal copper salts, appears of any practical utility. Acetate of copper and indigo are each of them too expensive; catechu is too restricted in its action. On the other hand, the ammoniacal salts of copper are adapted for general use, and are, comparatively speaking, cheap; and the slightly increased outlay necessitated by their adoption would be more than compensated by the assurance of greater durability in the timber so prepared.

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The French International Exhibition of 1878.—Regulations for Foreign Exhibitors.

The Commissioner General of the French International Exposition of 1878, to be held in Paris, has published the regulations for exhibitors. We extract the following from the articles relating to foreign contributions:

Article 5. Packages from abroad containing products destined for the Exposition must bear as distinctive marks the letters E. U., surrounded by a circle and traced by a brush. They are to be addressed to the commissioner of the exhibitor's country. Such packages will also bear the following indications, namely, the colors or emblems of their national flag. Foreign commissioners are expressly requested to inform the Commissioner General, at as early a date as possible, as to the form of address and special signs for recognition which each may adopt.

Article 6. Both French and foreign products will be admitted within the Exposition from January 1,1878, to March 30, inclusive. These dates are subject to the revision of the Commissioner General.

Article 7. The Exposition is constituted a custom house depot. Foreign products entering under customs laws may do so up to March 15.

Articles 8 and 9. These relate to the building of structures for heavy machinery, etc., under the direction of the Commissioner General. Work thereon may begin by December 1, 1877, and must be finished by February 15, 1878.

Article 10. Everything must be in place and in order by April 15. This provision will be rigidly enforced, and the Commissioner General will dispose of all allotted space either not occupied or incompletely occupied on that date.

Articles 11 and 12. Packing boxes must be emptied at once, and removed. If the exhibitor does not do this, the Commissioner General will have it done. Exhibitors must also take care of their own boxes, no place for storing them being provided.

Article 14. All exhibits must be removed by December 15, 1878. After that date they will be stored at the exhibitor's expense; and if not then removed before June 30, 1879, they will be sold for the public benefit.

NEW BOOKS AND PUBLICATIONS.

THE USE AND ABUSE OF THE STEAM BOILER. By Stephen Roper, Engineer. Philadelphia, Pa.: Claxton, Remsen, & Haffelfinger, Publishers, 624 Market street.

The author says in his preface that "the great mistake of many writers on the steam boiler and steam engine is that they write too much." This is peculiarly his own error, and the unnecessary existence of the present book proves the fact. It appears to be devoted to advertising a well known boiler insurance company, several boilers in common use, and some of the author's inventions. Such practical information as is given is useful, but is obtainable in much more condensed form in other works. The book, however, serves one good purpose in reminding us that we have not received that amended copy of Mr. Roper's previous production, in which he promised to give credit to the SCIENTIFIC AMERICAN for extensive extracts taken from our columns without a word of recognition; nor has he yet explained why he publishes a notice which we wrote of one of his works, garbled with self-flattering interpolations of his own.

DAVID AND ANNA MATSON. By Abigail Scott Duniway. Price $2.00. New York city: S. R. Wells & Co., Broadway.

This is claimed to be a poem, and the author informs us that she has "sniffed the bland breeze of the broad Mississippi" and "listened all rapt to Niagara's groan." She now has an opportunity to "sniff," and listen to the groan of the public.

HOW TO SING. By W. H. Daniell. Price 50 cents. New York city: S. R. Wells & Co., Broadway.

The author, an experienced music teacher, has condensed into this little manual a great many useful suggestions on the development of the voice. The work is written in colloquial style, is pleasantly readable, and can be commended to vocalists of all grades.

Recent American and Foreign Patents.

NEW MECHANICAL AND ENGINEERING INVENTIONS.

IMPROVED STONE-DRESSING MACHINE.

John C. Miller, Bridgewater, Va.—This has reference to a machine for grinding or dressing the ends or heads of grave and other stones into any required shape in rapid and convenient manner, without danger of injuring the slabs by cutting or otherwise. The invention consists of adjustable supporting pieces and holding planks, between which the stones are secured head downward, to be ground or dressed by a reciprocating trough with a metallic shaping plate containing sand and water.

IMPROVED LOCOMOTIVE.

William Holdsworth, Traverse City, Mich.—This is an improvement in the class of locomotives provided with wheels mounted on vertical axes and adapted to work in contact with a rail laid equidistant between the parallel rails, upon which the locomotive is supported in the usual way. The improvement relates particularly to parts for varying the pressure of the driving wheels upon the central friction rail, and for guiding and supporting said wheels while permitting their lateral and vertical adjustment.

IMPROVED SHIP'S WINDLASS.

Joseph L. Dickenson, Hempstead, N. Y.—This inventor makes the plug, which connects the chain wheel of a windlass (which reverses loosely on the shaft) with a fixed wheel, in sections. The object is to enable the movable wheel to be readily disconnected from the fixed wheel, so that the anchor may be easily let go, if need be, during the process of weighing.

IMPROVED ANTI-FRICTION BEARING.

James Warren and George Wilkes, Monroe, Iowa.—This consists of an arrangement of rollers of peculiar form, and bearing plates adapted to the rollers in such a way that the journals of the shaft to which they are applied will be relieved from end thrust, the object being to relieve the journals and steps, of vertical and other shafts that are subjected to end pressure, from strain and friction.

IMPROVED VALVE GEAR FOR STEAM ENGINES.

George E. Tower, Annapolis, Md.—This invention is designed for marine engines, but is applicable to others as well. It relates to a means for adjusting and working the main valves of an engine, whether the same be applied to the side or head of a cylinder. The chief feature of the invention is a shifting lever mounted on a rotating eccentric or crank, and connected with a rocking frame or equivalent device, which is capable of vibrating or remaining stationary while the engine is running. When the rocker is stationary the movement of the lever is least eccentric or irregular, and the valves cut off at about seven tenths of the stroke. But when the lever attains its greatest eccentricity, the valves cut off at about two tenths of the stroke. Between these limits the movement of the valves may be regulated at will. The variation in the position and movement of the lever is, in this instance, effected by an irregular cam, whose adjustment with the rocking frame shifts the point of connection between it and the lever, such point being stationary, or vibrating in the arc of a circle, correspondingly.

IMPROVED FEEDER FOR HORSESHOE MACHINES.

John W. Chewning, Jr., Shadwell Depot, Va.—This invention relates to certain improvements upon the horseshoe machine for which letters patent were granted the same inventor, August 29, 1876, and it consists in the construction and arrangement of a device for feeding the bar, from which the shoe is made, to the machine, whereby the operation of the sameis rendered automatic.

IMPROVED LOCOMOTIVE.

John Westcott, Tocoi, Fla.—This invention relates to a novel construction of a locomotive for drawing cars which are supported upon swiveling pedals that slide in lubricated channeled rails, and it consists in pivoting the supporting pedals in laterally adjustable bars, whereby they are made to adapt themselves to the channeled rails so as to obviate binding, and whereby also they are adapted to roads of different gage.

IMPROVED HORSE POWER.

Isaac Joyner, Jonesborough, Miss.—This invention consists of a wheel with spider frames that support an interior drum or cylinder, of sufficient size for the horse to walk in, the power being transmitted by a friction wheel, in contact therewith. One of the radial frames supports an outermost circle that forms, with suitable levers and friction shoe, an effective brake mechanism.

NEW HOUSEHOLD INVENTIONS.

IMPROVED SAD IRON.

H. B. Evans, St. Charles City, Mo.—This invention consists in a self-heating sad iron, having a removable fire box or drawer, a detachable top, and an inner partition for throwing the heat in a downward direction, the main object of the invention being to heat the bottom of the iron and keep the top comparatively cool.

IMPROVED CARPET CLEANER.

Sarah B. Stearns, Duluth, Minn.—This consists of a number of alternately working spring arms, with beaters or whips fastened to the ends, which are operated jointly with revolving dusting brushes at the ends of radial arms. The dusting brushes may be detached and replaced by scouring brushes to be used in connection with a suds trough.

IMPROVED VENTILATOR.

Henry A. Buzzell, St. Johnsbury, Vt.—This consists of a drum attached to the stove pipe, the drum being connected by pipes and funnels with the story below and with the upper and lower part of the room, to draw off the air to the chimney.

IMPROVED CLOTHES DRYER.

John F. Jaques, Moline, Ill., assignor to himself and John W. Bartlett, of same place.—This is a folding frame of peculiar construction, provided with cords for supporting clothes, forming a convenient clothes rack, and which is capable of being folded into a small compass.

NEW WOODWORKING AND HOUSE AND CARRIAGE BUILDING INVENTIONS.

IMPROVED CISTERN.

James Kennon, Jamestown, Ohio, assignor to Mary E. Kennon, of same place.—This is a walling for wells and cisterns, made of sections, or in one continuous piece of burned clay, with top covering, the upper edge or seat of the sections being made wider than the lower to support thereon the next, and form a kind of shoulder for the surrounding earth.

IMPROVED DOOR LOCK.

Gustav Winter, Denver, Colorado.—This consists of a door lock with two or more bolts and tumblers, which are so arranged in connection with the key hole guard plates, pivoted to the casing of the lock and operated by the bolts and key, that the key hole is closed at the side opposite to that from which the key is introduced.

IMPROVED CARRIAGE TOP.

George F. Knight, Carroll, Ohio.—This invention consists in making the top of a buggy or other vehicle of sheet metal, the same being fastened to an internal frame and braced by bolts, six in number, while the top is connected with the seat frame by front and rear braces, the latter being jointed and the former rigid. This construction is found to greatly facilitate the trimming of the top, as that can be done before the frame is bolted on, and therefore at much less cost than in the usual way.

NEW AGRICULTURAL INVENTIONS.

IMPROVED TOBACCO SUCKER GERM DESTROYER.

Joseph H. Knaus, John R. Harford, Walter C. Knaus, and Andrew J. Furr, Boonsborough, Mo.—The object of this invention is to improve the construction of the tobacco sucker germ destroyer for which letters patent were granted to Joseph H. Knaus and John R. Harford, January 11, 1876. In using the instrument, the handle is grasped in the hand, with the fingers beneath the cross bar, and the cavity between the arms is placed against the tobacco stalk, directly over the sucker germ, and is pressed against said stalk with sufficient force to cause a cutter to project against said germ. The cutter is then rotated, and cuts out and destroys the germ, so that it will not grow again.

IMPROVED FARM GATE.

William H. Richardson, Sheboygan Falls, Wis.—This is an improvement in that class of gates which slide open and shut over rollers, so that they may be operated with more facility, in less space, and not be so liable to get out of order. The invention consists in clamping two rim-grooved wheels to a gate bar so that each will revolve upon a rigid hollow bearing, through which the clamping bolt passes.

IMPROVED REIN HOLDER.

George W. Waters, Center, Mo.—This consists of a bar of wood having straps adjustably attached, for strapping the bar to the shoulders, and for connecting the reins to the bar, the object being to provide a device for guiding teams while plowing, or doing other similar work, which will permit of the free use of the hands and arms.

IMPROVED GARDEN RAKE.

Anna Maria Suydam, Waterloo, N. Y.—A blade of segment shape, with sharp edge, is bent in one piece with the tines, and forms a stiffening back for the same. It is made in line with the handle, and at about a right angle to the tines, and serves to clean and cut away the small patches of grass and bits of weed that are left in hoeing in the garden paths.

IMPROVED NOSE RING FOR SWINE.

Edmund S. Richards, Tripoli, Iowa.—The sharpened ends of a piece of wire are passed through the gristle of the hog's nose, bringing a roller on the wire just in front of said nose. Small leather washers are then placed upon the sharpened ends of the wire, and the said ends are bent down upon the outer sides of the said washers, securely fastening the ring to the hog's nose. When a hog with this device attempts to root, the roller turns upon the wire, and the hog can make no impression upon the ground.

IMPROVED HAY LOADER.

Joseph Richter, Laketown, Minn.—This invention relates to certain improvements in that class of devices which are designed for loading wagons with hay, straw, or grain. It belongs to that type of loaders in which an adjustable rake gathers up the hay and delivers it to an endless revolving apron provided with teeth, which apron is operated by a band and pulley connection with one of the driving wheels, and delivers the hay to the top of the wagon. The improvement consists in the particular construction, arrangement, and adjustments of the loading devices.

IMPROVED METHOD OF CHECKROWING CORN.

Charles B. Maclay, Delavan, Ill.—The convexity of the ground, passed over by a planter or seeder, necessarily modifies the distance between the hills planted. The gain or loss in this respect is noted, and may be corrected in this machine by means of an expansible wheel. A chain passes around this wheel and also a collar on the axle of the machine, so that the rotation of the wheel may cause the reciprocation of the seed slide. The wheel is expanded, more or less, to cause the slide to work more or less quickly, and thus drop the seed in hills a greater or less distance apart.

NEW TEXTILE MACHINERY.

IMPROVED PICKER CHECK.

Robert Davidson and John Richardson, Fall River, Mass.—This is an improvement in the class of friction devices designed for gradually arresting the picker staffs of power looms, in place of suddenly stopping them, as commonly practised. It relates to the means of attaching the friction strips to the shuttle boxes, and of adjusting the angle of the strips to each other, for varying the friction exerted on the picker staff. By means of adjustable brackets, the binders may be set nearer or farther from each other, and thereby the binding force of the check device increased or decreased.

NEW MISCELLANEOUS INVENTIONS.

IMPROVED CROQUET MALLET.

Harry Malin, Pleasantville, Pa.—This is an improved croquet mallet that will not bruise the balls, and makes them last much longer, while it requires a lighter stroke in playing. It has rubber caps or facings at the ends.

IMPROVED PORTABLE FIRE ESCAPE.

Herbert R. Houghton, New York city.—This fire escape consists of a wire rope having a series of cross bars or rests interlaced and lashed thereto, the said rope having a loop formed at its upper end, with an extension end, for convenience of escape upon the main rope. The whole is suspended by a snap hook caught in an eye, which is screwed to the floor of a room. As its weight is only about five lbs., it is suitable for the use of travelers and residents in hotels, for whom it is especially designed.

IMPROVED MACHINE FOR MOUNTING PHOTOGRAPHS.

Robert Sheane, Listowell, Ontario, Canada.—This invention consists of a box of two parts hinged together so as to open and close together with uniform action. In the lower part is a glass plate resting on a rubber or other elastic cushion, and in the upper part is a follower with an adjusting screw. The cards on which the photographs are to be mounted are put in the upper part, and pressed down one after another on the pasted pictures lying back upon the glass, which are thus pasted to and mounted on the cards by closing down one part of the machine on the other.

IMPROVED POCKET BOOK FASTENER.

Daniel M. Read, New York city.—This invention is an improvement upon that for which the same inventor has already received letters patent, and relates chiefly to the construction of the fastening attached to the strap encircling the pocket book, which is composed of a flat sheet metal top plate and a channeled bottom plate. The top plate is provided with an end extension, which is bent back over the end of the flap of the pocket book, to cover, protect, and confine said end, and the bottom plate has a lengthwise depression or channel forming a corresponding raised portion, in which are formed three holes to receive the pin fixed in the base plate.

IMPROVED CIGAR HOLDER.

John Hutton, New York city.—This is a skeleton holder consisting of the mouth piece in combination with the spring arms and semicircular clips which grasp the cigar. It is made in one piece from hard rubber.

IMPROVED PROCESS OF LITHOGRAPHING TRANSFERS.

Charles R. Biedermann, St. Louis, Mo.—This invention consists mainly in dispensing with the preliminary treatment of the stone for causing it to absorb fluid matter beneath its surface, which is effected by hardening the copy on paper into a solid type by the application of nitric acid, and transferring, and fixing the hardened copy upon the stone by heating the same to blood heat, without chemical treatment of the stone.

IMPROVED COMBINED GAS METER AND CARBURETER.

John M. Cayce, Franklin, Tenn.—Mr. Cayce's present invention relates, first, to an improved gas-measuring apparatus, adapted for use, like other meters, in dwellings and other buildings, and also for performing the function of a secondary motor for operating an air-carbureting apparatus. The chief element of the apparatus is a bi-chambered wheel or cylinder, of what may be termed annular segmental form, which is partially immersed in water or other liquid, suitable for sealing its open ends, and is oscillated upon its axis by the passing current of gas required to be measured, each reciprocating movement thereof causing the vibration of a weighted lever, and thereby the reversal of a four-way cock, by which the gas current is caused to enter one chamber of the wheel while the other is discharging its contents, and *vice versâ*.

IMPROVED DRESS CLASP.

Alexander L. Fyfe, London, England.—This clasp is adapted to be attached to a chain provided with a hook for attachment to the waistband. The dress is held in a clip, which consists of a pair of jaws, cupped or hollowed, and having on one a spring pad or cushion which fits in the hollow of the other, and thus securely retains the dress. The pad consists of a disk of metal, cupped or hollowed, with a spiral spring behind it, and is fitted in the hollow of one of the jaws. The jaws are provided with a runner, so formed as to embrace and compress them firmly together at the point where the dress is held. The runner may be of any desired form, and the back of the jaws may be corrugated or roughened transversely to ornament them, and at the same time retain the runner more securely in position.

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Business and Personal,

The Charge for Insertion under this head is One Dollar a Line for each insertion. If the Notice exceeds Four Lines, One Dollar and a Half per Line will be charged.

For Sale—10 in. Bement Slotter, Friction Hoisting, and Mining Engines. J. S. Mundy, Newark, N. J.

Agricultural Implements and Industrial Machinery for Export and Domestic Use. R. H. Allen & Co., N. Y.

Henry F. Lawrence, who received a Patent on Tunnels, Aug. 6, 1872, will please address Frank H. Winston, Evansville, Wis.

Catarrh—Dr. Karsner's Remedy. Sure Cure. Sample Free. J. C. Tilton, Pittsburgh, Pa.

For Specialties in Woolens, Seamless Roller Covers, Printers' Blankets, &c., address H. Waterbury & Co., Rensselaerville, Albany Co., N. Y.

Metallic Letters and Figures to put on patterns of castings, all sizes. H. W. Knight, Seneca Falls, N. Y.

Wanted—On royalty, by a reliable house, some good practical invention in Cast Iron, Brass, or Machinery, to work as a specialty. Address Foundry, Station B, Philadelphia, Pa.

For Sale—5 ft. Planer, $290; 3 ft. do., $175; 18 in. x10 ft. Lathe, $225; 1¼ in. Bolt Cutter, $125; 22 in. x12 ft. Lathe, $200; 38 in. Drill, $275. At Shearman's, 309 Arch Street, Philadelphia, Pa.

Send $1.75 to Milton Bradley & Co., Springfield, Mass., for a perfect Dress Plaiting Machine, or address for circular to agents.

The Target Air Pistol kills cats, rabbits, squirrels, pheasants, pigeons, and other small game. Mailed, post paid, for $3.78. Send stamp for circular and testimonials. E. H. Hawley, 188 Orange St., New Haven, Ct.

Best Bolter for Sawing Handles, Furniture Stuff, Wagon Stuff, Fence Boards, &c. Send for Circulars. Richard W. Montross, Galien, Mich.

Send 20 cents to Milton Bradley & Co., Springfield, Mass., for New Mechanical Drawing Book; or address for a circular.

Wanted—To purchase Theine or Caffeine largely. Price and particulars to Mr. Dison, Canonbury Lodge, Canonbury, London, England.

For Sale—⅓ interest in the Adding Pencil recently illustrated and described in this paper. Address M. M. Smith, Kirksville, Mo.

The surprising results in saving of fuel by the use of Asbestos Steam Pipe and Boiler Coverings are worthy the attention of every one using steam. The genuine can be procured of H. W. Johns, 87 Maiden Lane, New York, patentee and sole manufacturer of Asbestos Materials.

One Friction Clutch Pulley, 36 in. diam. x22 in. face, 4 in. bore; and one do. do. 36 in. diam. x12 in. face, 3½ in. bore, used to drive cold rolled shafting at Centennial. For sale low by V. W. Mason & Co., Prov., R. I.

Baxter's Adjustable Wrenches, price greatly reduced. Greene, Tweed & Co., 18 Park Place, N. Y.

Slide Rest for $8 to fit any lathe. Goodnow & Wightman, 23 Cornhill, Boston, Mass.

To Lease—The largest portion of the building corner Canal, Center, and Walker Sts., now occupied as a Billiard Manufactory and Sales Room. See advertisement in another column.

The Cabinet Machine—A Complete Wood Worker. M. R. Conway, 222 W. 2d St., Cincinnati, Ohio.

The Gatling Gun received the only medal and award given for machine guns at the Centennial Exhibition. For information regarding this gun, address Gatling Gun Co., Hartford, Conn., U. S. A.

Journal of Microscopy—For Amateurs. Plain, practical, reliable. 50 cents per year. Specimens free. Address Box 4875, New York.

For Sale—Shop Rights to every Tool Builder and manufacturer for Bean's Patent Friction Pulley Countershaft. D. Frisbie & Co., New Haven, Conn.

Superior Lace Leather, all Sizes, Cheap. Hooks and Couplings for flat and round Belts. Send for catalogue. C. W. Arny, 148 North 3d St., Philadelphia, Pa.

Magic Lanterns, Stereopticons, for Parlor Entertainments and Public Exhibitions. Pays well on small capital. 74 Page Catalogue free. Centennial Medal and Diploma awarded. McAllister, 49 Nassau St., N. Y.

Noiseless Exhaust Nozzles for Exhaust Pipes and Pop Valves. T. Shaw, 915 Ridge Av., Phila., Pa.

Fire Hose, Rubber Lined Linen, also Cotton, finest quality. Eureka Fire Hose Co., 13 Barclay St., New York.

The Scientific American Supplement—Any desired back number can be had for 10 cents, at this office, or almost any news store.

To stop leaks in boiler tubes, use Quinn's Patent Ferrules. Address S. M. Co, So. Newmarket, N. H.

Water, Gas, and Steam Pipe, Wrought Iron. Send for prices. Bailey, Farrell & Co., Pittsburgh, Pa.

For Solid Wrought-iron Beams, etc., see advertisement. Address Union Iron Mills, Pittsburgh, Pa. for lithograph, &c.

Solid Emery Vulcanite Wheels—The Solid Original Emery Wheel—other kinds imitations and inferior. Caution.—Our name is stamped in full on all our best Standard Belting, Packing, and Hose. Buy that only. The best is the cheapest. New York Belting and Packing Company, 37 and 38 Park Row, New York.

M. Shaw, Manufacturer of Insulated Wire for galvanic and telegraph purposes, &c., 259 W. 27th St., N. Y.

F. C. Beach & Co., makers of the Tom Thumb Telegraph and other electrical machines, have removed to 530 Water Street, New York.

Power & Foot Presses & all Fruit-can Tools. Ferracute Wks., Bridgeton, N. J. & C. 27, Mchy. Hall, Cent'l.

For Solid Emery Wheels and Machinery, send to the Union Stone Co., Boston, Mass., for circular.

For best Presses, Dies, and Fruit Can Tools, Bliss & Williams, cor. of Plymouth and Jay, Brooklyn, N. Y.

Steel Castings, from one lb. to five thousand lbs. Invaluable for strength and durability. Circulars free. Pittsburgh Steel Casting Co., Pittsburgh, Pa.

Hydraulic Presses and Jacks, new and second hand. Lathes and Machinery for Polishing and Buffing metals. E. Lyon, 470 Grand Street, New York.

Diamond Tools—J. Dickinson, 64 Nassau St., N. Y.

"Dead Stroke" Power Hammers—recently greatly improved, increasing cost over 10 per cent. Prices reduced over 20 per cent. Hull & Belden Co., Danbury, Ct

Lansdell's Pat. Steam Syphons—Lansdell & Leng's Lever and Cam Valve. Leng & Ogden, 212 Pearl St., N. Y.

Walrus Leather, Emery, Crocus and Composition for polishing Metals. Greene, Tweed & Co., 18 Park Place, New York.

D. Frisbie & Co. manufacture the Friction Pulley—Captain—best in the World. New Haven, Conn.

For Sale—Two first class Household Articles, by State or Counties. Address Duke & James, Lancaster, Pa.

To Clean Boiler Tubes—Use National Steel Tube Cleaner, tempered and strong. Chalmers Spence Co., N. Y.

Chester Steel Castings Co. make castings twice as strong as malleable iron castings at about the same price. See their advertisement, page 365.

Patent Scroll and Band Saws, best and cheapest in use. Cordesman, Egan & Co., Cincinnati, Ohio.

Notes & Queries

It has been our custom for thirty years past to devote a considerable space to the answering of questions by correspondents; so useful have these labors proved that the Scientific American office has become the factotum, or headquarters to which everybody sends, who wants special information upon any particular subject. So large is the number of our correspondents, so wide the range of their inquiries, so desirous are we to meet their wants and supply correct information, that we are obliged to employ the constant assistance of a considerable staff of experienced writers, who have the requisite knowledge or access to the latest and best sources of information. For example, questions relating to steam engines, boilers, boats, locomotives, railways, etc., are considered and answered by a professional engineer of distinguished ability and extensive practical experience. Enquiries relating to electricity are answered by one of the most able and prominent practical electricians in this country. Astronomical queries by a practical astronomer. Chemical enquiries by one of our most eminent and experienced professors of chemistry; and so on through all the various departments. In this way we are enabled to answer the thousands of questions and furnish the large mass of information which these correspondence columns present. The large number of questions sent—they pour in upon us from all parts of the world—renders it impossible for us to publish all. The editor selects from the mass those that he thinks most likely to be of general interest to the readers of the Scientific American. These, with the replies, are printed; the remainder go into the waste basket. Many of the rejected questions are of a primitive or personal nature, which should be answered by mail; in fact hundreds of correspondents desire a special reply by post, but very few of them are thoughtful enough to enclose so much as a postage stamp. We could in many cases send a brief reply by mail if the writer were to enclose a small fee, a dollar or more, according to the nature or importance of the case. When we cannot furnish the information, the money is promptly returned to the sender.

R. B. L. will find directions for polishing pebbles on p. 138, vol. 30.—J. D. will find a description of a method of utilizing the waste heat from lime kilns on p. 290, vol. 32.—J. D. will find directions for tanning sheepskins with the wool on p. 233, vol. 26.—B. I. will find a good recipe for black ink on p. 250, vol. 34.—R. I. & U. K. should consult *The Hub*, published in this city.—L. A. F. will find an article on potash in corn cobs on p. 306, vol. 26.—J B. P. will find a description of a spring power for sewing machines on p. 134, vol. 27.—F. L. will find a recipe for a balloon varnish on p. 74, vol. 32.—J. S. M. will find directions for painting magic lantern pictures on another page of this issue. For a recipe for jet black ink, see p. 250, vol. 34.—M. G. S. will find a recipe for Babbitt metal on p. 122, vol. 28.—W. F. S. will find the demonstration of his rule for finding the area of a triangle in any good book on trigonometry.—F. E. B. will find directions for ebonizing wood on p. 50, vol. 33.—J. W. B. will find directions for preserving cider on p. 11, vol. 31.—D. will find an explanation of the travel of car wheels on a curve on p. 268, vol. 35.—R. L. K. should put a tablespoonful of coarse brown sugar in a quart of flour paste, to fasten paper labels to tin cans with. This also answers F. F., who will find a recipe for a blue lacquer on tin on p. 75, vol. 32.—W. B. P. will find directions for gilding without a battery on p. 106, vol. 34. For silver-plating without a battery, see p. 299, vol. 31. For nickel-plating with a battery, see p. 151, vol. 30.—G. F. R. will find something on keeping water fresh on p. 156, vol. 31.—F. W. E. should galvanize his iron sink. See p. 346, vol. 31.—R. B. W. will find a recipe for a hair stimulant on p. 363, vol. 31.—W. will find directions for treating a corn on p. 202, vol. 34.—W. A. will find directions for making vinegar from cider on p. 106, vol. 32.—S. D. P. will find directions for waterproofing canvas on p. 347, vol. 31. For keeping cider, follow the directions on p. 11, vol. 31. For a recipe for bird lime, see p. 547, vol. 28.—J. S. P. will find an answer to his query as to rotary engines on p. 123, vol. 30.—J. H. R. will find a recipe for oroide metal on p. 347, vol. 30.—F. H. N. will find articles on compound engines on pp. 122, 260, vol. 30.—R. L. will find the dimensions of the propeller of the Baxter canal boat on p. 281, vol. 29.—R. A. C. is informed that Mr. Charles Darwin, the evolutionist, is living.—E. B. can drill china with a sharp, swiftly revolving steel drill. For coppering iron, see p. 90, vol. 31.—C. E. S. can line his cooking kettles with a porcelain coating by the process described on p. 362, vol. 32.—H. B. B. will find a scription of vulcan and rend-rock powders on p. 2, vol. 34.—E. T. B., G. M. W., J. A., G F. S., A. W. A., G. D., P. G., and others who ask us to recommend books on industrial and scientific subjects, should address the booksellers who advertise in our columns, all of whom are trustworthy firms, for catalogues.

(1) J. H. I. says: 1. Please give me a recipe for restoring the color to cloth, the color having been taken out by lime. A. Have you tried a little dilute muriatic acid? The most satisfactory method, perhaps, will be to have the cloth re-dyed. 2. How can I restore the color to a straw hat which has become yellow? A. Subject it to the vapor of a dishful of burning sulphur (sulphurous acid gas) in a tight box or closet.

(2) G. P. H. says: How can we make rawhide soft and pliable for hobbles, bell collars, lassos, etc.? Is it the glue in the hide that makes it so hard? What is the best method to soften it? Oil alone will not do it. A. The hides of animals, owing to their complex chemical structure and the large amount of nitrogenous principles which they contain, are very prone to rapid putrefaction when exposed to a moist air. In very dry climates they soon lose their natural suppleness and become stiff and hard by a process of desiccation. It was by the effort to overcome all these difficulties that the process of fixing the gelatinous bodies contained in the hide, that is, the system of tanning them, was first introduced. We do not know of a better one that we deem practicable in your case.

(3) E. G. W. says: I hear that a German society has offered $400 prize for a cheap and efficient way of extracting the carbonic acid from coal gas. Does petroleum gas contain the acid, and does the acid impair the light? A. Gas from petroleum contains only a very small quantity of carbonic acid. The quantity is so small that it may be altogether overlooked.

(4) H. C. asks. Would filtering vinegar through a common filter (that is composed in part of charcoal) change the color or injure the vinegar in any way? A. Make your filter of animal charcoal, or freshly or thoroughly burnt vegetable charcoal. If the charcoal has not been thoroughly burnt it may impart some unpleasant taste to the vinegar. If the vinegar be allowed to pass slowly through the filter, a part, at least, of the dark color will be removed.

(5) F. B. asks: How shall I bleach a silken fabric? A. Have you tried sulphurous acid? This is the usual bleaching agent employed for silk, but it requires some previous technical experience in the matter to be enabled to do it well. After being sulphured, the goods are passed through an extremely dilute solution of sulphuric acid, and washed,

(6) J. H. R. asks: What degree of heat does it require for calcining gypsum in an oven? The gypsum is broken about the size of hickory nuts. How long will it take to make good stucco out of it? A. If, as we understand you, you wish to ignite the gypsum in order to obtain plaster of Paris, it is necessary to remove the greater part of the water of crystallization by heating the mineral for some time at a temperature of about 300° Fah. If the temperature is allowed to rise above 360°, it will not, when moistened, resume its water of crystallization. There are numerous other precautions necessary to be observed, in order to obtain a good product. See p. 173, Science Record, for 1874.

(7) E. K. M. says: Our home-made hard soap, in drying, shrinks very much. What can we do to make it retain its shape? A. All recently made soap shrinks more or less in drying, from the loss of water. This cannot be avoided.

(8) C. D. asks: How are blank spaces obtained in an engraving produced by the photo-engraving process? I understand the method of photo-engraving (by means of the sunlight passing through a photographic negative and falling on a plate of glass coated with a film of gelatin and bichromate of potash, etc.); but I have never yet seen in any description of the process an explanation of the means employed to obtain the wide blank spaces in the engraving: spaces, say, from a quarter of an inch to an inch in width. Are such lights in the picture obtained by eating away the spaces between the reliefs with acids in the stereotype plate, or are the spaces cut out of the plate with the engraver's tools? A. See pp. 178, 235, 139, vol. 33, and pp. 95, 186, 169, 168, 185, Science Record for 1876. You will find, by examination, that the references to this and other similar processes have been very numerous in the back numbers of the Scientific American. 2. Do you know of any acid that will corrode or soften plaster of Paris, after the plaster has been mixed with water and has hardened, so that the parts touched by the acid may be brushed away with a moderately stiff brush? A. Sulphate of lime is soluble to some extent in hydrochloric and nitric acids, also in sulphate of ammonia. 3. What is the hight of the lines in relief in an engraving obtained by the photo-engraving method after the soluble film has been washed away from the glass plate? A. This depends altogether upon the thickness of the films, as well as their number and the length of time of exposure to the light.

(9) H. C. says: What composition can be applied to floors before laying carpets, to preserve them from the attack of moths? A. Use a dilute alcoholic solution of carbolic acid: about 1 part of the acid to 12 or 15 parts of alcohol.

(10) C. P. asks: 1. What is the best material to add to linseed oil while boiling, to give it the hardest drying quality? A. According to Barruell, Jean, Mulder, and others, the borate of manganese is the most excellent siccative. 2. How much of the dryer should be added? A. Use 1 part to 1,000 parts of the oil. 3. How can linseed oil, which has been darkened in boiling, be economically bleached, in considerable quantities? A. It is usually bleached by exposure to strong sunlight in shallow leaden trays (about 4 inches deep) covered with sheets of glass.

(11) J. L. A. asks: What will directly destroy a human tooth, in the mouth or out? A. There is no such substance or preparation known.

(12) H. P. I. says: I use a large wood tank to hold brine, which wastes by passing through the pores of the wood. Is there anything that can be applied to the wood that will fill the pores, and not be acted upon by the brine? Would soluble glass do? A. Perhaps a preparation of asbestos might answer your purpose; this may be obtained in this city, as you will see by consulting our advertising columns. Soluble glass we have not tested in that respect.

(13) R. K. P. says: I have a well in my cellar that is full of foul air. How can I remove it? A. Drop a pipe into it, within a few inches of the surface of the water, and then pump the air out. Fresh air will take its place.

(14) J. S. says: There is a wooden partition dividing two rooms. I wish to know if the sound of loud talking and laughing can be stopped, so that persons in an adjoining room can hear nothing but a humming or indistinct noise. Will caulking up the cracks and tacking soft carpet paper, $\frac{1}{16}$ of an inch thick, keep back the sound? A. Nail a few upright strips upon the face of the partition, and cover it with cloth, wet a little, stretched taut, and tacked to the strips. Now put a wall paper upon the cloth; at the same time fill up the joints of the plank in the present partition where open.

(15) C. A. asks: Can limestone, which has been put in a kiln, and has not been heated enough to extract all the carbonic acid (that is, it does not slake), be put again, after cooling, in another kiln, and make good lime if heated sufficiently? A. Yes.

(16) C. F. asks: I want to coat pump tubing on the inside with coal tar. The tar is to be boiled until all the water is evaporated and it becomes hard and brittle when cold. Would it affect the water so as to make it offensive for family use? A. Good asphalt or pitch might answer, but we cannot insure success in all cases. The method of charring the exposed surfaces of the wood is much more desirable and efficient than the one you suggest.

(17) L. N. says: 1. A man nearly lost his life by sleeping in an upper room of a house adjoining a lime kiln. When found, he was insensible, and could not be resuscitated for over an hour. The doctor says that the effect was produced by gas from the kiln. Some of us do not believe that, as there could not be much gas in the room. The house is about 30 feet from the kiln, and the gas must have entered by the window. A. The doctor's surmise is very probably correct. 2. How much gas must there have been to produce this result? A. Ten per cent of the gas in the atmosphere of a room is sufficient to produce asphyxia in a healthy person remaining for a short time in the room; but this is subject to wide variations, according to the age, physical condition, etc., of the person breathing the vitiated air.

(18) O. C. asks. Do the forces arising from the attraction of gravitation and from momentum depend on the same law for their effective action? To illustrate: If a force of 10 lbs. on a given lever will raise 100 lbs., then double that force will raise 200 lbs. And if 60 lbs. steam will drive a saw 700 revolutions per minute through a 6 inch stick, then it will require (in theory) 120 lbs. to drive it at the same speed through two 6 inch sticks. In practice, I find that force on the lever has the same effect that it has in theory, but that steam has not. The amount of steam is not required to be doubled. One says that this is on account of the momentum, which is not governed, even in theory, by the same law that gravitation is governed by. I contend that it is on account of friction, which theory does not allow for, and that momentum and gravitation, as above illustrated, are governed by the same laws in theory. Am I right? A. You seem to have the right idea.

(19) J. F. D. says, in reply to A. E. & Co., who wish to augment the capacity of their flouring mill: You appear to be running the mill to a decided disadvantage. I would suggest that, instead of putting in another run of burrs, you run the ones you have up to their capacity. With the stones properly drafted and dressed, and run at proper speed, you ought to grind at least 15 bushels of wheat per hour on each run, and that will give the engine all it can do. I know it can be done, for I am averaging 20 bushels of wheat per hour on a 4 feet burr, and 35 bushels of corn on a 3½ feet, running both at once and making a yield of over 42 lbs. of flour per bushel. Our engine is about the same size as the one mentioned, but we have a rather larger boiler.

(20) G. E. T. says, in answer to H. S. G., who asked if the cloth would not absorb more sulphuric acid in the mixture of 80 gallons water and 2 lbs. sulphuric acid than in half that quantity. The cloth, if thoroughly agitated and of any considerable quantity, say from 10 yards up, would absorb nearly the whole of the acid. I do not think there would be a loss of 10 per cent more acid by using the larger quantity than the smaller.

(21) J. H. N. says, to W. H. J., who asks us to explain how car wheels get round a curve: 1. A car wheel is some 2 inches larger on the inside, or next to the flange; and so the car wheels, in going round a curve, always run up to the flange on the outside of the curve, which of course is the longest rail, and so bring the inside wheel to bear on its small end. A. It must be evident that, unless all the curves of a road have the same radius, the curving of the wheels will not prevent slipping in some cases. 2. Why do the wheels and rails on the east side of north and south roads wear out the fastest? A. Experienced railroad men believe that this does not happen when a track is kept in proper order.

(22) H. E. E. says, in answer to W. H. F., who asks which car wheel slips in going round a curve: Neither. I have often seen a distiller roll his barrels to a warehouse some 50 yards away on two poles laid parallel about 2 feet apart; the barrels swayed from side to side and adjusted themselves automatically, and kept the track, although at one place there was an abrupt angle of 15° or 20°, which is worse than a regular curve

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on a railroad. If the barrel is placed on the track too far to the right, that part of the barrel where it touches the right rail is larger than the part where it touches the left rail, which causes the right hand end to roll faster than the left hand: and if it should roll too far over to the left, the same thing will take place on that side. And so it is constantly adjusting itself on the track, with no cause for either end to slip. even in turning a curve. Just so with the car wheels (which are conically shaped from the flange outward), provided a proper amount of lateral play is allowed by laying the track a little wider than the flanges on the wheels would indicate.

T. P. H. asks: How do dentists harden and polish their vulcanized rubber plates?—A. R. asks: What will give a white porcelain finish, with glassy surface, to wood? It must be impervious to dampness.—S. Bros. ask: Is there a successful way of treating the material for pianoforte sounding boards in order to increase the volume and duration of sound?

COMMUNICATIONS RECEIVED.

The Editor of the SCIENTIFIC AMERICAN acknowledges, with much pleasure, the receipt of original papers and contributions upon the following subjects:

On the Earth's Motion. By J. A. B.
On Light, Space, and Matter. By A. S.
On Spiritualism. By J. W. M.
On a Measure of Value. By B. M.
On the Bible and Progressive Thought. By P. F. P.
On Cotton and Wool. By A. R. L.

Also inquiries and answers from the following:

G. B.—D. L.—W. B.—T. J. L.—R. & B.—J. T. C.—E. C.—L. O.—A, J. W.—C. S.—W. S.—J. D. H.

HINTS TO CORRESPONDENTS.

Correspondents whose inquiries fail to appear should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them. The address of the writer should always be given.

Enquiries relating to patents, or to the patentability of inventions, assignments, etc., will not be published here. All such questions, when initials only are given, are thrown into the waste basket, as it would fill half of our paper to print them all; but we generally take pleasure in answering briefly by mail, if the writer's address is given.

Hundreds of inquiries analogous to the following are sent: "Who buys ores of antimony? Who makes spiral springs? Who makes electric engines? Who makes flexible shafting?" All such personal inquiries are printed, as will be observed, in the column of "Business and Personal." which is specially set apart for that purpose, subject to the charge mentioned at the head of that column. Almost any desired information can in this way be expeditiously obtained.

[OFFICIAL.]

INDEX OF INVENTIONS

FOR WHICH

Letters Patent of the United States were Granted in the Week Ending

October 24, 1876,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

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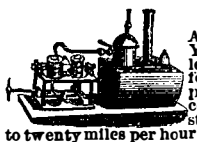
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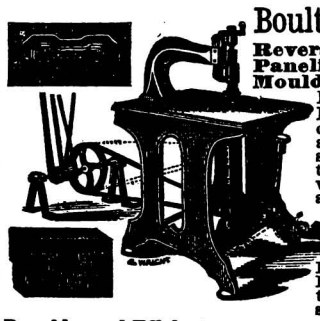

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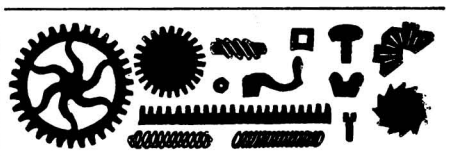

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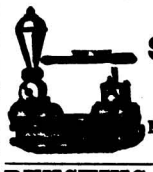

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